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The Farmer's Digest

From more than two hundred magazines and bulletins published in this country and abroad, the Editorial Staff of the Farmer's Digest selects articles of outstanding merit and general interest. It is comprehensive in its scope, covering all phases of Agriculture.

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The Farmer's Digest

Volume 3 December, 1939 Number 8

The Development of Dairy Heifers

Condensed from Certified Milk

E. G. Harrison, Ph.D.

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IN discussing this important phase of the dairy business I believe that there are several considerations that must be thoroughly understood.

1. What is the cost of growing a heifer from birth to the freshening age? Under our conditions the cost will vary from 100 to 125 dollars, depending upon feed costs and the age of the heifer at first freshening. The cost is fairly definitely fixed and does not vary widely with the quality or the productive inheritance of the heifer.

2. Is it more economical to raise or purchase the necessary replacements? From the standpoint of production costs against purchase cost the answer depends entirely upon the productive ability of the heifer raised. If the heifer possesses a low productive inheritance, without a doubt she could be purchased for less money than the cost of growing her. On the other hand if she possesses an inheritance which will enable her to produce a large yield of milk and butterfat, she can be raised for less than her sale value.

This question, however, cannot be decided entirely upon a comparison between the cost of raising a heifer and the price for which she might be purchased. In the first place if a large number of dairymen concluded that they would purchase all of the necessary replacements there soon would be a shortage of cows and a definite increase in the cost of replacement. Secondly, there is the problem of disease. It is extremely difficult, if not impossible, to maintain a disease-free herd when purchased replacements are continually being added. Thirdly, if good cows are purchased for replacements and no female offspring raised from them, it would have the same effect on the dairy breeds as if these cows were sent to the butcher. In other words, if

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any percentage of our dairymen followed such a practice it could only result in lowering the average production of our dairy cattle. Fourthly, unless one uses good bulls and raises the necessary replacements he has no hope of a better herd, without purchasing higher quality replacements at a greater cost.

There are two facts that I want to get over to you. First, practically every argument favors raising the necessary herd replacements. Secondly, the costs of growing a replacement are so great that only heifers from profitable producing dams, and sired by good bulls should be raised. The most economical time to cull is at the time the heifer is born. Regardless of how satisfactory a feeding and management program one follows if he starts with a heifer that has an inheritance for low and unprofitable production he has no chance of success. The upper limits of a cow's productive ability is fixed at the time of birth and cannot be increased by any feeding or management practice. On the other hand, a high productive inheritance does not insure a high producing cow. It is necessary to provide an opportunity for development which is in accordance with her inherited ability.

In discussing the topic of proper development of young stock, I believe I can best cover the subject by using the University herd as a basis.

One of the first problems that we had to solve was the control of calf diseases. I find this generally true of all the large herds that I visit. Usually the small herd does not have a serious calf disease problem. For a number of years our losses from calf diseases, especially calf pneumonia, were rather heavy. At first we felt quite sure that the trouble was the result of unsatisfactory housing conditions. Others had concluded the trouble was caused by improper feeding and management practices. Experimentation and observation did not confirm these early beliefs. We discovered that if we put calves in small groups in clean quarters with no contact with the sick calves, they would do well. This observation provided the first lead to prove of value. From that date we have been developing a program which would enable us to develop our calves in rather small units. The reason for this program is based upon the observation that calf pneumonia increases in virulence with each new infection. In other words, adding new calves to infected quarters is like adding wood to a fire.

We have now built a cheap summer calf barn at the experimental farm where the spring and summer born calves can be

raised. This barn will make it possible to remove all young calves from the main barn and thoroughly clean, disinfect and rest all the calf barns long enough for all possible infection to die out. In addition, this past summer a small brooder type calf house was built. The plan is to start a group of young calves in this small unit. If at three months there has been no trouble these calves will be transferred to the larger calf barns and after disinfecting and rest, it can again be occupied by young calves.

By this plan our calf losses have been greatly reduced and we believe we may be able to practically eliminate them. This plan should be equally effective in the control of other calf troubles, such as white scours.

The first essential in the proper development of young stock is continuous growth. Thus uniform feeding conditions must be provided throughout the growing period. There are a number of feeding systems which will give satisfactory results. I feel that the system we are using at Cornell has many advantages and has been tried on enough calves so that there can be no doubt concerning the results that can be obtained. According to this system, the calf remains with the dam for 24 hours, at which time it is removed to the calf barn. The mother's milk is fed, however, for several days. During the first two weeks whole milk should make up the entire diet. Care must be used to guard against overfeeding. It is not advisable to feed a calf all the milk it will drink. We never exceed 10 per cent of the body weight, i. e. a calf weighing 100 pounds would be limited to a maximum of 10 pounds per day. In the case of weak calves it is frequently necessary to feed much less than 10 per cent of the body weight. Starting with the third week the calf is offered small amounts of high-quality hay. We prefer an early-cut, fine-mixed hay over straight legume. At the start of the third week we also begin feeding the dry calf starter mixture. Care should be used to prevent this feed from becoming sour and unpalatable. As soon as the calf learns to eat the hay and grain the whole milk can be decreased. Following this plan we limit the calf to about 350 pounds of whole milk and by the end of the seventh week the whole milk is discontinued and the calf is on dry feed entirely.

The dry calf starter and high-quality hay provides the entire diet until the calf is consuming up to 4 pounds per day of the starter. One pound of a good fitting ration is then offered. At 16 weeks the calf starter is discontinued and replaced with an equal amount of fitting ration.

As the consumption of hay increases the amount of fitting ration can be decreased to about three pounds per day, particularly if the hay is of high quality.

This ration is continued until the calf goes to pasture. There are many things that are essential to observe if proper use is to be made of pasture. (1) Heifers under 6 months of age cannot make satisfactory growth on pasture alone. (2) Heifers should be gradually changed from barn feeding to pasture. We use small pasture plots near the barn for this purpose. At the start the calf is turned out for an hour or so and then returned to the barn for its regular feed. Each day the calf is left on pasture a longer period, and at the same time the barn feeding is reduced. About 10 days to two weeks is required to make this change. This practice prevents the over laxative effect of the pasture and insures that the calf gets off to a good start. By nitrogen fertilization these small pasture plots can be ready for grazing at least 10 days before the regular pasture and therefore this practice need not prolong the barn feeding period.

Throughout the pasture season one must keep in mind that continuous growth is essential which requires uniform feeding conditions. Therefore, whenever the pasture becomes short additional feed must be offered.

Winter feeding of the yearlings, is very simple if the heifers have made continuous growth on pasture and good hay is available. Hay is the most satisfactory feed for growing heifers. The hay not only provides the cheapest possible source of food nutrients but also has a definite influence upon the body development. In the mature dairy cow a deep capacious body is essential for maximum use of roughage. Our dairy cows will not possess this capacity unless the heifer feeding program develops heifers with deep middles. The feeding of large amounts of concentrates tends to produce fattening and shallow round bodies. On the other hand the consumption of large amounts of hay will produce maximum growth, well sprung ribs and deep capacious middles.

The quality of the hay provided is extremely important. It is not necesary to have a straight legume hay, although it should contain a reasonable per cent of legumes. The stage of maturity at cutting and the harvesting method is more important. We have found that our heifers will eat at least twice as much high quality early-cut hay as they will a late-cut weathered hay. A decrease of three pounds in hay consumption requires the feeding of two pounds additional concentrates. Thus the amount of con-

centrates required per heifer per day will depend entirely upon the hay. We find that if good hay is provided it is never necessary to feed more than three pounds of concentrates per day. The plan should be to feed just enough concentrates to insure satisfactory growth.

The age that the heifer can be brought into production depends upon how rapidly she has been grown. We are freshening a number of Holstein heifers this year just past 2 years of age, weighing over 1300 pounds. These heifers have all milked over 60 pounds per day. Thus we consider that it is good business to provide feeding conditions that will permit continuous growth because we are freshening our heifers at least 6 months younger than would be possible under a less satisfactory feeding program. Obviously if the growth period is shortened by six months there will be a great saving in production costs.

Aids for Trunk Injury

A good discussion of trunk injury to fruit trees is given in a Michigan report by Prof. F. C. Bradford, together with the best treatments. He discusses three types of injury, namely, sunscald, frost cracks, and bark splitting. "Sunscald" occurs on the southwest side of the trunk or scaffold limbs and is the result of a warm sunny day followed by a cold night. Since this type of wound heals only from the sides, all dead bark should be removed and a wound dressing applied to the exposed surface. It is suggested to line the edges of the wound with grafting wax and cover the bulk of the wound with asphalt emulsion. "Frost cracks" are thought to be due to a rapid fall in temperature following a warm period, causing a contraction in the outer rings of wood while the interior of the trunk is still warm and expanded. These cracks usually close when the temperature rises, and no special treatment is required. "Bark splitting" refers to the type of injury in which the bark splits and rolls back from the surface. It is thought to be due to the collection and freezing of moisture between the wood and the bark. This type injury is most common on trees on heavy moist soil and is found on the side from which cold winds most commonly blow. The bark remains alive but may dry out. Accordingly, the treatment is to tack the flaps of bark in place.—*H. B. T., Rural New-Yorker*

Home of the Thoroughbred Horse

Condensed from The Southern Planter

WHEN you read in your morning paper last May that Johnstown had galloped home ahead of a brilliant field at Churchhill Downs to win the Kentucky Derby and $46,350 in cash for his owner, William Woodward, you sensed the sensational side of the Thoroughbred race horse.

Horse racing is now a major sport in 20 states. In 1937, $14,363,562 was distributed in stakes and purses to winners in 16,250 races in the United States, covering 2,140 days of racing. Paid attendance and amounts wagered at these races ran into staggering sums. Horse racing contributes millions of dollars in taxes each year to strained state and Federal treasuries. But all of this deals with the sporting side of the Thoroughbred horse. Back of the betting, training and racing of Thoroughbreds is the more romantic and pastoral business of breeding the young animals for replacements in racing stables. The raising of race horses has been described as the "culture of agriculture."

The South is the natural home of the Thoroughbred horse. Of the 476 Thoroughbred breeding establishments listed in the 1937 "American Racing Manual," 339, or 72 per cent, are located below the Mason-Dixon line. The three states of Kentucky, Virginia and Maryland account for nearly 60 per cent of all race horse breeding farms in the United States, and produce the great bulk of yearlings sold each year. The remaining farms are scattered over 20 states.

The long growing season, mild winters, and abundance of bluegrass pasturage, rich in feed value and bone building materials, combine to give the limestone country of Maryland, Virginia and Kentucky a tremendous advantage in the production of superb racing stock. The finest Thoroughbred stallions in the world are standing in this rather strictly defined area.

The colts are foaled here, handled with meticulous care, and most of them are transported by train or van to Saratoga Springs, New York, in August of their second year to be sold at auction to racing stables. One public auction organization, the Fasig-Tipton Company, headed by Mrs. K. L. Tranter, sells approximately 90 per cent of all Thoroughbred yearlings produced in the country. About 65 per cent of those

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October, 1939

handled by Fasig-Tipton are auctioned off at Saratoga Springs, the balance at Lexington, Kentucky, in the fall. Some are sold at Pimlico during the fall meeting at the Maryland track, and small lots are disposed of at private sales in various sections of the United States.

The sales at Saratoga are held in the evening, starting at 8.30. Mornings and afternoons are spent by prospective buyers examining the yearlings and studying their breeding. About 700 seats surround the sales ring, each reserved especially for the occasion by a breeder or racing tycoon. It is doubtful if a more celebrated group of Americans assemble for any other annual event.

The yearlings are led into the silver roped ring, each with head high and nervously tramping the green sawdust floor. Excited stable boys, jockeys and trainers crowd every inch of space surrounding the auction block. Hearts beat faster as Brownie Leach announces the yearling's breeding, and Doc Bond, begins the "chant of the auctioneer." Bidding is rapid and rivalry keen. As many as 50 or 60 yearlings are sold each evening, and a quarter of a million dollars may change hands.

There is no phase of livestock production requiring more science and greater skill than the breeding of race horses. Blood lines and careful crossings mean everything. The fashionably bred yearling, Whisk Broom, was sold at Saratoga by Mrs. Thomas J. Regan, well-known Kentucky and Tennessee breeder, some years back for $75,000. We saw Samuel D. Riddle, Maryland and Kentucky breeder, pay $20,000 at the Saratoga sales in August last for a colt by Blenheim II out of Argosie, by Riddle's immortal Man o' War. The highest priced yearling for the 1938 season was a Virginia bred colt produced by William H. Lipscomb at his Raspberry Plain farm in Loudoun county, Virginia. It sold for $22,000. From these top prices for yearlings "bred in the purple," we have seen common stuff sell for as low as $100. Colts sell on the average for about twice as much as fillies. Last year colts averaged at the Saratoga sales $2,851 each; fillies, $1,676.

Thoroughbred mares are bred to foal just as soon after January 1 as possible for the reason that the foals are reckoned one year old on the first of January that follows, irrespective of the date they were foaled. Furthermore, colts that come early are older and stronger when they enter training and, consequently, make better showings as two-year olds than later foaled colts. Foaled early, colts escape flies, are old enough to graze when grass ar-

rives and can be weaned successfully before grass is killed in autumn. The mare is generally bred back about 9 days after foaling.

Larger breeders keep several stallions, but those with only a few mares send them to studs for breeding. One stallion is used on from 12 to 40 mares in a season, depending upon his age, vigor and the demand for his services. Stud fees vary with the brilliance of the stallion's breeding and his ability to sire winners. Sun Briar, Willis Sharpe Kilmer's great stallion, sire of the leading money winning horse of the world ($376,744) and Virginia bred to the core, Sun Beau, stood at Court Manor in the Valley of Virginia for $5,000 a service. Fees of $500 to $4,000 are not considered exorbitant for proved sires. The popularity of a stallion increases as his get win races.

For example, Pilate is in great demand at $1,000 per service at A. S. Hewitt's Montana Hall Farm, White Post, Virginia, because his 5 three-year olds racing this season have all been winners; 3 have won big stakes, and at this writing, two—Eight-Thirty and Lovely Night—bid fair to be among the best winners of 1939. To be a great race horse is one thing, but to prove a great sire is another. Few horses have been both.

Many famous sires have been owned jointly by a number of breeders and their services apportioned according to percentage of ownership. Scores of valuable horses have been so purchased abroad and imported for breeding purposes. It was thus that the celebrated French stallion, Teddy, was imported a few years ago for $65,000 at 18 years of age to stand at K. N. Gilpin's Kentmere Farm, Boyce, Virginia. Teddy died 2 years ago but his colts, Bull Dog, Quatre Bras II, Sir Gallahad III, and others, are carrying on in fine fashion.

The feeding of brood mares and foals was well stated by Charles G. Herring of the Herring Brothers sometime ago: "You're actually feeding three different animals when a bred mare is suckling a colt. The mare must be fed enough of the right feeds to keep her thrifty and in good flesh; to enable her to produce plenty of milk for the suckling; and finally, to develop the unborn foal into a strong, well-formed individual. Our feeding is gauged accordingly."

Grain (oats, corn and bran), hay (alfalfa, clover and timothy), pasturage (bluegrass and clover), some protein concentrates and minerals are the basic feeds used by Thoroughbred breeders. These are blended and fed according to the whims of the breeder. On clear days, in early spring, mares and foals are put on pastures,

but when weather is rough they stay inside. As hot weather and flies arrive they are often turned out to graze during the cool of the evening and at night.

Colts learn to eat at an early age, and are given every encouragement. Mares are regularly tied up in the stalls to give the colts a chance to eat. Heavy oats, legume hay and some form of protein concentrate make up the bulk of the suckling's feed. They are weaned at 5 to 6 months of age. Open mares may nurse their colts longer.

Foals are handled early in life and taught to lead before they are weaned. After they are 3 months old, the feet are trimmed every 60 days. Hoofs are never allowed to grow out and break off. A little attention may prevent bad feet, fatal to any race horse. The colts are fed liberally during the winter, principally heavy oats, leafy legume hay, and pasturage in pretty weather. Water is always before them. Grain feeding continues while on grass the following spring and summer. The yearlings are generally penned during the blazing summer days to prevent coats from sun-burn. Grazing is done in the cooler part of the day. The coats are carefully brushed daily and occasionally washed as the August sales approach. They weigh around 900 pounds and shine like silk when sold.

Within a couple of days after being auctioned off, jockeys are breaking the yearlings to ride. They are galloped daily on the track during the late summer and fall months to develop muscles and endurance for the spring racing season as 2-year olds. The most promising individuals go South for short races on the Florida tracks in late winter and follow the racing season North. As the 2-year olds develop, they are entered in longer races, and by fall are equal to almost any task. They are raced the following year as 3-year olds. Those fillies that fail to show promise as runners are sold to riding academies or breeding establishments; slow colts are unsexed and tried out as geldings. Winning colts and fillies are raced until retired to stud and breeding establishments. This affords breeders an opportunity to purchase the "cream of the crop" for their establishments.

Periodic dispersal sales of breeding stock are another means whereby breeders acquire new bloodlines. Complete dispersal of Sanford Stud Farms' stallions, foals, yearlings and brood-mares at the recent Saratoga sales, after 40 years of breeding classic stake winners, gave Thoroughbred breeders just such an opportunity to pick up some of the finest breeding stock on this Continent.

And so goes the story of breed-

ing the Thoroughbred horse; an important phase of agriculture in Virginia and neighboring states that is little known and grossly neglected; an undertaking that has as its end the thrilling of millions of racing fans around the world. It is an agricultural enterprise that has tremendous possibilities here as abroad where scores of small farmers keep a mare or two and breed to the best stallions available. These little fellows frequently turn out some of the best Thoroughbred horses.

Winter Sheep Rations

Condensed from Successful Farming

THE greatest possible use of homegrown feeds has always been a top principle of the successful livestock-producer. Ordinarily, no better use of such feeds can be made than in the wintering of the farm sheep flock, but experimental results in recent years have shown that certain combinations of home-grown feeds, while entirely suitable in other ways, may be deficient in protein or calcium.

Sheep in northwestern Minnesota are commonly wintered on prairie hay alone. On this ration, they are unthrifty in winter, often becoming ill and dying toward spring. Ewe lambs kept over for breeding ordinarily make little or no growth. Bred ewes lose considerable weight and many of the older ones die. Because cattle in this territory frequently suffer from a shortage of phosphorus in the roughage grown on the low-phosphorus soils, it has commonly been thought that the trouble with sheep arose from the same cause. To learn more about the exact cause of this trouble and to find ways of correcting it, the Minnesota Experiment Station recently set up a co-operative experiment with 20 yearling ewe lambs purchased from a farm in northwestern Minnesota.

In general the conclusions of the station were that sheep get decidedly too little protein when wintered solely on prairie hay, timothy, or other non-legume roughage. A little linseed, cottonseed, or soybean oil meal will make up the shortage, at the same time correcting a phosphorus deficiency when one exists.

The most interesting contrast in the experiment was between the pen of ewes that received only prairie hay and salt and the pen that received prairie hay, salt, and a concentrate, which

Reprinted by permission from Successful Farming, Des Moines, Iowa, February, 1939

provided both protein and phosphorus. At the end of 13 weeks, the first pen had gained only about 5 pounds per head, while the second pen had gained about 22 pounds per head!

One-fourth pound per sheep per day of linseed, soybean, or cottonseed meal will result in good growth. One pound per sheep per day of a legume hay or grain will likewise be helpful. Even when grown on low-phosphorus soil, the legume hay will be about twice as rich in phosphorus as prairie hay, and the grain will be 4 times as rich. The experiment indicated that the cost of these feeds will be paid for by the increase in wool alone; for sheep receiving the protein supplements grew exactly twice as much wool as those which were fed no extra protein.

In demonstrating the outstanding importance of protein in sheep-feeding, this Minnesota experiment warrants the careful attention of all sheep-producers whether in low-phosphorus areas or not, since virtually all non-legume roughages, wherever grown, contain considerably less protein than needed for a properly balanced ration.

The Ohio Agricultural Experiment Station has also made an important contribution to sheep-feeding practices. In a recent experiment it came to the conclusion that a ration of shelled corn, protein supplement, and timothy hay is definitely deficient in calcium for best results with winter-fed lambs.

The addition of ½ ounce of limestone flour (35 percent calcium) to the ration daily resulted in keener appetites and greater ability to consume feed; 20 percent greater gains; nearly normal calcium and phosphorus content in blood serum; and stronger bone-development.

In a later test, purebred Delaine Merino ewes were fed a ration of corn and oats, protein supplement, alfalfa hay, and corn silage, a ration known to be highly efficient and entirely satisfactory in calcium content. A comparable lot of ewes were fed the same ration with the alfalfa hay replaced by chopped, barn-stored corn stover, the protein supplement increased from 0.15 pound to 0.45 pound, and 0.75 ounce of limestone fed daily per ewe. In health, condition, and milk-production; and in the weights, gain, strength, and vigor of the lambs produced, there was no significant difference in results with the two rations. These results are highly encouraging and suggest methods of making greater use of home-grown feeds.

Why Doesn't More of the Chicken Money Come Home to Roost?

Condensed from Farm Journal and Farmer's Wife

Robert W. Howard

EIGHTEEN profits are taken on every coopful of poultry that clucks to market, and four other profits are made on the eggs they lay before leaving home.

That is why the consumer will pay from two to three times as much as the farmer gets for the 39 billion eggs, the 700 million chickens, the 30 million turkeys, ducks and geese due to come from the American land in 1939.

Poultry, celebrating its 90th birthday as a U. S. farm crop, has grown to be Agriculture's second greatest industry, supplying cash to 91 out of every 100 farmers. Only after it grew up did it discover that too much time had been spent on production, too little time on merchandising.

Back in Iowa, this morning or tomorrow morning, a country buyer will pull up to a farmer's door and offer him 17c a pound for 20 plump chickens. The chickens will weigh exactly 100 lbs., bring the farmer $17 in cash. Next morning they will roll off toward a commission merchant in New York City.

The country buyer will receive $18 for the chickens; their share of the frieght bill will come to $1.82. Added to their cost, too, is the 36c paid to the attendant who will feed them en route, plus 40c for the feed itself. Somewhere between Ottumwa and the Hudson River they will lose enough weight to reduce their valuation by 71c.

Labor in handling them at the New York yards will cost 33c, while the loader who moves the flock from car to platform will get another 12c, and the weighmaster who puts them on the scales will get 32c. The chickens will be charged 36c for coop rentals while they are in the commission man's quarters. Their city inspection will cost another 4c. The commission man when he sells the 20 to a slaughter house, will take a fee of $1.10. By that time, the cost of the chickens has risen from $17 to $23.56.

But it still costs 50c to truck

Reprinted by permission from the Farm Journal, Philadelphia, Pa., September, 1939

them to the slaughter house, with another 75c going to the truck driver and to the loaders at each end of the haul. The "schochet," a butcher who can kill poultry in accordance with the Jewish church ritual, will get 50c for beheading the 20 birds. The slaughter house itself will charge 75c for "general administration" and will take a profit of $1.25.

Finally, the retail butcher will expect a profit of $1.70 and the pluckers will charge another $1.25 for dipping the bodies in boiling wax, and then pulling wax and feathers off in one motion.

So eventually, the chickens reach Bronx or Brooklyn housewives, at a cost of $30.26. Some times the retail price is more, sometimes less, but high or low the 18 intermediate pay-stations await most of the poultry that comes liveweight to the eastern markets. It does not vary if the farmer receives 17c a pound or 7c a pound.

And it is one of the problems that New York City means to tackle this winter through the construction of a $500,000 union terminal for all the live fowl entering its environs.

More than one half of the 153,000,000 pounds of live poultry coming to New York each year is shipped by truck. It goes to a score of receiving stations. Other terminals receive the flocks that arrive by railroad. The city has maintained 12 stations and a battalion of roving inspectors in recent years. Even then quantities of fowl were bootlegged into the slaughter-houses.

The union terminal will be open to all dealers, will particularly encourage producer co-operatives. Sheds, offices and sidings are to be leased by the city to a co-operative Terminal Operating Company at a rental of $60,000 per year.

The operating company will purchase feed, slats, coops and other supplies in carload lots for re-sale at cost. This should cut down one item in operating expenses. In time there is to be a rendition plant for fertilizer, and a canning plant to take care of the culls.

"We hope," Commissioner Morgan said, "to be able to cut the price range between live and dressed poultry from 8c to 4c a pound. That should mean 2c more for the farmer and 2c less to the consumer. We'll do everything in our power to make it work that way."

If the market proves a success, Chicago, Philadelphia, Boston and other live poultry centers may follow the example. Then the chicken may gain the same merchandising organization that livestock has in its union stockyards, grain has in its elevators and trading pits.

The egg is another problem.

Like the chicken, it surges into the cities from every state of the Union. Thirteen states each produce more than a billion eggs a year; Iowa usually ships over two billions; riding them into the deep South, into Yankeedom, even crossing the Rockies to invade the homeland of the Pacific coast poultrymen. And here, too, is a bewildering distribution system.

On August 7, the GLF's Egg co-operative was paying 27c a dozen for Grade A white eggs in upstate New York. From this, the farmer deducted an average of 1.2c for shipment into New York City.

The GLF office in Manhattan grades the eggs, sells them to a jobber at 29c a dozen. The jobber resells, without checking, to a storekeeper for 31c a dozen. However, if the jobber candles and re-grades, he expects a mark-up of 7c to 8c a dozen, bringing his sale price to 36c or 37c.

Finally, the city storekeeper, according to GLF, expects a mark-up of 10c to 12c a dozen, bringing the final retail price of the 27c eggs to a minimum of 41c, a maximum of 50c. This was in August when cold-storage holdings averaged 135 million lbs. of frozen eggs, and two and a half billion grade B and C eggs.

Similar conditions hold in the dressed and frozen poultry fields. Yet, claim the experts, close examination of the market shows that few of these intermediates could be eliminated, even in an ideal set-up.

Talk is turning naturally to new uses for all poultry's products. But outside the development of a spray-method for drying eggs, and localized efforts around New York City to market smoked turkey, the poultry field has pushed along its century-old rut of meat and eggs and eggs and meat.

First step in research was finally taken on June 1 by the American Association of Poultry Industries when it set up $26,000, under the name of the Poultry Producers' Revolving Fund to be used for research work in discovering egg by-products. Laboratories have been established at Iowa State under the direction of Dr. George L. Stewart, formerly of Cornell. But experiment, in poultry as in other fields, will take years or decades to bring any noticeable change in demand.

Hogs May Harvest Sorghums

Condensed from The Nebraska Farmer

Wm. J. Loeffel

Acting Chairman of the Animal Husbandry Dept., University of Nebraska

HOGGING off corn has been recognized as a standard practice. Last year the question arose whether the same practice might not also be applied to the grain sorghums with equal success. It was believed that if the sorghum grains could be hogged off that one of the chief objections to sorghum production might be overcome. In recent years no project has captured the fancy of farmers and livestockmen so much as this investigation and requests for information concerning it have come in large numbers.

In June, 1938, three varieties of grain sorghums—Day, Sooner and Early kalo—were planted and at the same time some Minnesota No. 13 corn was planted. Crop conditions in 1938 were not essentially different from those of 1939 except that the hot dry weather came a little later which, together with grasshopper damage, reduced the corn yield to approximately 7½ bushels per acre or a trifle over 400 pounds of grain per acre. The grain sorghums, on the other hand, matured a fair crop of grain, ranging from 31 bushels for the Day milo to 38 for the Sooner.

The sorghum plots were divided into tracts of 1½ acres each. Each lot was further crossfenced to give the pigs access to approximately one-third of an acre of the grain sorghums. Fifteen pigs were turned into three lots on September 11. Five of the lots were fed good protein supplements such as tankage, skim milk, and a mixture of tankage and cottonseed meal, half and half. All the lots received a simple mineral mixture composed of two parts steamed bone meal, two parts ground limestone, and one part of salt.

The pigs worked terrible execution in the Sooner milo and the Early kalo lots, knocking down stalks with reckless abandon. Some folks prophesied that hogging down sorghums would not work, that there was too much waste connected with it. The pigs did waste some grain; however, as soon as the sorghum was flat on the ground they proceeded to eat it in a very satisfactory way.

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As the grain became fairly well cleaned up, additional acreage was given them.

The pigs were permitted to remain in the sorghum plots until October 9, a total of 28 days. The pigs which were fed a good protein supplement with the sorghum gained on the average 1.51 pounds per day, whereas those which had no supplement gained only 1.04 pounds. One of the outstanding lessons shown by this trial was the need for feeding a good protein supplement when hogging down sorghum grain. Not only did the pigs which received the supplement gain more rapidly but they made more efficient use of the grain. The pigs which had the supplement made 100 pounds of gain with an expenditure of approximately eight bushels of sorghum grain, whereas where the sorghum grain was fed unsupplemented, 10½ bushels of grain were required. These figures are based on charging the pigs for all the grain in the lots. Some of it, of course, was wasted and was later salvaged by stock pigs and brood sows. This year, through co-operation with the poultry department, an effort will be made to salvage this grain a little more completely by using either turkeys or growing chickens.

Averaging all the lots in the test, even the one which received no protein supplement, 435 pounds of pork were produced per acre. It is interesting to note that the amount of pork produced where the sorghum grain was hogged off was approximately equivalent to the number of pounds of corn produced in the corn lot. In other words the producer may choose between corn, sorghum grain, or pork. Four hundred pounds of pork per acre, even at the present low price of hogs, is a fairly satisfactory return per acre considering that no harvesting expense was involved. Figuring hogs at five cents per pound, they returned on the average of 47 cents per bushel for the grain sorghum in the field, after deducting the cost of the protein supplements at market price.

Watch Them Walk!

Condensed from The Aberdeen-Angus Journal

Otto V. Battles

I'M sorry O. V., but she did not show quite enough 'gaiety' at the walk to go to the top."

This remark was from a well-know British judge at Chicago a number of years ago when, after he had completed his judging, he and I were engaged in an amicable discussion of the rating he had given what I still consider was the greatest calf I have ever shown. But she did not walk to suit the Britisher that day in the arena at Chicago when, as a yearling, I had high hopes of her going through to a grand championship; she had been a junior champion the year before. She was a little stale from two years of fitting and campaigning over strenuous show circuits and the experienced eye of the Scotchman was quick to discern it and evoke the penalty. And he was right, for she never did make the show herd again.

But why, may be asked, make such a to-do over a little lack of grace in the walk of an otherwise almost perfect animal? I knew at the time and consequently had no criticism to offer. I had had an opportunity to observe, a few years previously while myself judging at the most prominent show in Scotland, how particular the founders of our breed are about combining style and grace of carriage with an ideal beef conformation, and although the way a beef animal walks may seem of little concern, putting it in the light of comparison to the gait of a saddle horse, I believe however the British are right when they insist on maintaining good legs and good feet under their cattle. I do not recall ever having seen a bad walker in the show ring or in the breeding herds of either England or Scotland. There must be a reason and here is my version of it.

In neither Scotland nor England does one find the extremely high-fitted breeding cattle that prevail in our American show rings and which seem to be necessary to even attract much attention from a great many of our judges.

The British cattle are prime, but fresh and nimble on their feet. They carry enough finish of good quality to indicate their fleshing possibilities.

Why should that not be sufficient? Why should it be necessary for American exhibitors to feed some of our most prized animals "off their feet" in order

Reprinted by permission from The Aberdeen-Angus Journal, Webster City, Iowa, June 15, 1939

to convince the judge of their merit? I have discussed this question many times with other exhibitors and they always agree that we are over-doing this fitting business, but that under our present system of judging it seems to be necessary in order to win. When asked for a remedy to the situation, they offer different opinions. The one I have heard most frequently expressed, however, is that we employ too many judges who are not actual breeders but who come in from allied fields, many of whom place more emphasis on thickness than upon qualities associated with an all-around good breeding animal. But have breeder-judges proved a superior ability in this respect.

But at any rate, as self-protection, exhibitors are going to continue to fit their animals to the limit until they have some assurance that a different system of judging is to be followed. This is the way one prominent exhibitor expressed himself to me during the recent Golden Gate International Exposition at Treasure Island in San Francisco Bay.

"I know that my cattle, which have been on the road almost continuously since last August, should be taken home and given a good cooling out and started fresh again in a few months for the late summer and fall circuits. But instead of that I feel that I must continue to 'pour it to them' with the view of having them just as fat as I can possibly get them for the opening of the summer shows." Here, I think, we have the general run of exhibitor's opinions in a nut shell. "Is it possible," say some other exhibitors, "to obtain judges who are expert enough to recognize the ultimate outcome of a moderately fitted animal that is fresh and alert on its feet, or must we fit our cattle to the point of staleness in order to prove how thick it is possible to make them?"

Please note that I am speaking of breeding cattle from which we expect long lives of usefulness in our breeding herds after their show careers are ended. The same rule would probably not apply to animals shown in the fat classes whose ultimate end comes all too soon by the way of the block. Excess fat put on them is sold for so much per pound, so there is at least no factor of economic waste to be considered there as is the case with breeding cattle.

Of course, all highly fitted cattle are not bad walkers. In fact, it has been my experience that only a very small minority are so affected and as far as my observations go, the tendency is more noticeable in bulls. And when a highly fitted bull is an extremely bad walker he makes a sorry show of himself. He is anything but a good advertisement for his

owner or for the breed he represents.

There are other things, of course, than over-feeding which can temporarily at least, affect the walk of an animal and which, in my opinion, should not be counted against it by the judge. Some of these are: corns, foul-foot, stone-bruises, and too close trimming. Experienced judges should however, have no difficulty in separating these temporary impediments to graceful movement from the more serious ones resulting from over-feeding.

The above remarks can hardly be construed as a preachment because I have included myself among the offenders, if fitting our show cattle to the limit can be called an offense.

There is still another angle to the question of the way our animals walk in the show ring, particularly our bulls, and perhaps it is the most serious of all. It is whether we are paying enough attention to breeding into our cattle a proper setting of legs. In other words, are we getting the legs squarely enough set under each corner and as straight as they should be?

I think I hear this kind of criticism offered more frequently than any other, particularly from South Americans. I have discussed Aberdeen-Angus matters with them in both Great Britain and America with a view of learning why they continue to buy all of their breeding stock in Great Britain rather than taking some from us.

During these discussions they have invariably offered as one of the reasons, a comparison between the walking ability of the cattle of the two countries, which, in their opinion, is greatly in favor of Great Britian. They have told me that before we send many of our cattle to South America we must make some improvement in this respect, and in their opinion the best way to do it is to get the legs out on the four corners of our animals and setting straight, in which case the animal is almost sure to walk well.

I find also from talking with South Americans, that they particularly criticize our bulls for being narrower between the hocks than the thickness of their thighs indicates. I am inclined to believe that there may be something in the conformation of the hindquarters that predisposes toward bad walking when the animals are too fat, other things considered. And that possibly by improving the conformation of the hindquarters, as above indicated, that even our over-fat animals would fail to show any serious symptoms of bad walking.

It occurs to me that it might be educational to have a study made by some competent person or persons to determine the way

in which the column of bone in the hind legs, from the hip joint down to the hock, lies in various cattle within the same breed and in different cattle. We might, by such a study, find something of importance just as fruitful as the studies on the set of the legs in the horse proved to be a hundred or more years ago. However, I must confess that I do not know enough about it at present to make any comments. Such a study might be a good project for one of the colleges where they have veterinary anatomists, as well as live stock judges, present to investigate.

Possibly a majority of breeders will feel that there is no urgent need of improvement in the hindquarters of our bulls, particularly in the setting of their legs. However I feel that there is always room for improvement. Furthermore, I am positive that more bad walking cattle are turning up in our show rings right along, and this being the case it seems to me that it is time that we take serious notice of this condition and try to do something to remedy it, because, after all, we are all interested in seeing our breed make the greatest progress possible in every direction.

Candy That Grows on a Tree

Condensed from Nation's Business

THIRTY years ago, there was less than one American date to every million imported; today, there is one date that has ripened in the desert sun of the Coachella or Salt River Valley for every dozen brought overseas from the Levant; and it is within reason to look forward to a time when practically all of the 70,000,000 pounds of dates annually consumed in the United States will be grown on American soil.

The date's relation to its grower is the most intimate of agricultural relationships. The palms were created male and female. Down through the centuries no insect has ever performed the necessary task of pollination. The work has been left for man to perform and today men may be seen dusting the female blooms with powder puffs of pollen, or tying sprigs of the male blossom among the female buds.

To add to the general complexity of date culture, no date that grows from seed is ever true to type. Instead, at the age of five years, the palms begin to raise a family of offshoots. A thriving tree will produce ten to twenty daughters, worth from $3 to $5 each. A male palm will produce

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sons in the same manner. With both, the propagating period is comparatively short, ending when the tree is 15 to 20 years old. Fruit bearing, however, continues for at least 200 years, quite probably longer, and a century-old date palm is barely in its prime.

Dates do not ripen in a bunch like grapes. Instead, each bunch must be picked over from 20 to 25 times during the harvesting season which runs from September to January. The palms may attain a height of from 80 to 100 feet. In practice, the palms are usually taken out at a height of 50 feet, for above that height the expense of constructing picking platforms and ladders becomes too great.

There are probably a quarter-million date palms growing today in the Coachella and Imperial Valleys of California, the Salt River, Yuma, Casa Grande, and a few other southern valleys of Arizona. They are generally planted 30 feet apart, with one male palm to each planting of 50 female trees. It requires six years and between $2,000 and $3,000 to bring each acre of palms to the point where they begin to yield some return.

The date is a natural confection, preserved in its own sugar. There is about 75 per cent of sugar in a date, so much in fact that the fruit is not damaged by below freezing temperatures.

American dates are harvested, graded and packed under the most pleasing sanitary conditions. Cleanliness is desirable but it is also expensive. Irrigation is costly when, as in the Coachella Valley, the water is pumped to the surface from deep wells, but when the canal system is completed, water will be cheaper although it will still be costly in crop production.

There are also natural hazards. A light rain that would do practically every crop good is ruinous in a date garden during the long harvest season. High humidity may have a similar effect. The moisture causes the thin skin of the ripening dates to break, mold follows, and the fruit is lost. By way of protection, paper "raincoats are attached to all date clusters in late summer and remain on the clusters until harvesting is completed.

Sulfanilamide

Condensed from The Jersey Bulletin

Prof. Oscar Erf

Ohio State University

MASTITIS has always been considered a swelling or inflammation of the mammary glands of the cow. With the numerous terms used for this condition, another common expression is garget. The common swelling in the udder during parturition is usually and normally an edematous condition. However,swelling of the udder may also indicate a number of types of infection. Most of these types belong to the bacterial family known as cocci.

While there are a large number of groups of this family, a long-chain, hemolytic streptococci are responsible for a majority of these infectious diseases. The second group, known as the short-chain, may have been under-emphasized in the past. While we are not familiar enough to say that they are agents that cause mastitis, we have considered them suspicious. We feel that there are many instances where this type of streptococcus should be considered as a factor that produces some pathological alterations. They seem to be the forerunner of more serious infections later on.

We have carefully studied mastitis from a bacteriological standpoint since 1926 for the purpose of safeguarding natural milk. We have found it through our investigations to be a very important factor. Later, Dr. Speer and Dr. Morrey, of the Department of Bacteriology at Ohio State University, became interested in this work and a particular state herd was selected. It was found that the udders of cows from this herd were seriously infected with the long-chain streptococci. While these men did a great deal of basic work and at the same time used many of the practices common to the dairymen and scientists, the results were more or less negative.

Finally Dr. Speer began to develop an autogenous vaccine which was the most succesful. After several years of vaccination, we found this to be the most efficient method of treating cows up to the time he retired from the university. The constant demand for natural milk made it

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imperative to have some method by which this disease could be eliminated from the herd. Consequently, it seemed that the most feasible practice to be considered was the isolation of all cows in the herd that had been and were infected with long-chain streptococcus.

In 1935, however, a German comment on the discussion of a chemical substance which destroyed long-chain streptococcus was noticed. Dr. Domagk discovered the product which is now known as sufanilamide and found it very effective in eliminating some forms of streptococcus infection in rats. A small portion of this product was secured and given to cows. Nothing was known about the dosage at the time and nothing was known of the effect it had on cattle, so the quantities that were fed in the beginning were too small and had comparatively little effect. Gradually, the quantities were increased up to a point of tolerance. This was characterized by nervousness and weakness of the cow and the blue color of the lining of the mouth of cows.

Our first definite results, which gave us great encouragement, happened to be on the Randleigh Farm, Lockport, New York. One of the highest producing cows came down with an acute mastitis infection and had a temperature of 107½ within three days after parturition. Mr. Kenan then called a veterinarian, Dr. McLaughlin, to administer 900 grains of sulfanilamide as an experimental dose, which was then considered a large quantity. The effect of feeding this material was gratifying. The temperature came down to 105 in twenty-four hours and 102 in forty-eight hours; 800 grains were fed the second day. The treatment was continued for fourteen days, reducing at the rate of from 50 to 200 grains per day until she had received but 100 grains on the 14th day. The aggregate amount fed in the fourteen days was 7,000 grains. After feeding sulfanilamide, there were no long-chain streptococci found in the milk. This milk was submitted to three other separate laboratories and the same results were found. This was very gratifying. However, in the course of time, two months later, the test indicated that they again reappeared in the milk of the infected quarters. The cow, however, completed her period of lactation with no serious inconvenience, and has been milking ever since. She is in apparently good health. The cow, when milked, still shows the presence of a streptococcus organism from this quarter when not fed sulfanilamide.

We have had cows suffering with severe acute mastitis throughout the country and in every case the cow recovered

shortly after feeding this quantity or even as low as 700 grains per day.

Sulfanilamide has been found to be of great value for cows that suddenly develop inflammation in one or more quarters; and it has been of infinite value for small herds in which mastitis appears quite frequently.

In no case have we found that sulfanilamide has been injurious to the animal even though the long-chain and short-chain streptococcus have been present.

There are some cows that are sensitive to sulfanilamide and smaller quantities must then be given. Or, if the sensitivity is too great, sulfanilamide may be eliminated. In all of our investigational work, we have seen only one cow that has been sensitive to the drug.

It is not to be construed that the feeding of sulfanilamide acts as a permanent cure. It does materially reduce the number of cases of acute mastitis after a month or two. In many cases, a higher rate of milk production occurs after feeding sulfanilamide than before sulfanilamide was given. Immediately after it is fed the milk production always seems to go down but after the effect is over, the milk production increases. However, long-chain streptococcus may remain in the milk. The feeding of sulfanilamide has not eliminated these infections permanently. Neither does it alter the particular nutritional factor of the milk.

There was one farm on which the cows were so heavily infected that practically all of them had the long-chain streptococcus in their milk. The month previous to our testing, six cows died in the herd from mastitis. No cows have died since the first sulfanilamide was fed at the first indication of an inflamed quarter. In fact, on all of these farms, there was not a single death in the two years that could be traced to the administration of sulfanilamide. Of course, on all of these farms, sulfanilamide was fed only when needed and was introduced into the feed only when there was an enlargement or an inflammation in one or two quarters.

So far, five herds have kept clean in the past three years by the eradication method. This method promises to be a practical one but is still in the experimental stage. It is quite necessary with this method to have proper sanitary arrangements and proper technique of milking. Namely, (1) the use of chlorine on the milkers' hands and chlorine applied to the teats of the cow before and after milking. (2) Milking machines that are equipped with the proper sterilizing methods and the proper application of antiseptic materials applied to the teats have been found to be very

effective in maintaining a clean herd. (3) Where the cows have been infected with short-chain streptococcus, they were immediately removed from the stable and fed sulfanilamide. When the milk did not remain free from streptococcus, they were immedily removed from the herd. Positive mastitis cows could not be allowed to pasture with negative cows.

In herds where there was no attempt made to remove the cows that were infected from uninfected ones, sulfanilamide has been used to a great advantage. In these herds, the principal aim is to keep the herd going with as little effort and expense as possible. With the use of sulfanilamide, this can be done with apparently little reduction in the amount of milk produced per cow as far as we can estimate. Of course, it must be recognized that milk from treated cows is not always free after a long time from long-chain streptococcus and could not be used in a natural milk supply. It could be used for milk for manufacturing purposes in cities where high temperature pasteurization has been adopted.

In our animal feeding, small doses apparently have no effect in improving the conditions of the animal, especially where it does not lower the temperature in case of inflammation. In cows, it seems that 4.5 milligrams per 100 grams is essential for the elimination of long-chain streptococci in the blood. With this dosage, 1 to 1.5 milligrams of sulfanilamide are found in the milk. By tests, such milk is found to be harmless. The work is being continued in order to find methods that are more practical and where the milk, free from long chain streptococcus can be more definitely maintained and by feeding the cattle feeds that are a protection against this infection.

Mr. W. R. Kenan has recently purchased a farm, other than the Randleigh Farm, where he keeps a mastitis herd to carry on research work in a herd in which all the cows are infected with mastitis.

Summary

(1) Our work to date indicates that mastitis infection caused by long-chain streptococci can be eliminated from the herd temporarily by the use of sulfanilamide.

(2) For a natural milk supply the positive cows should be separated from the negative ones. The negative cows should be kept clean by repeated testing.

(3) The milk from infected cows should be heated or pasteurized at temperatures that will destroy the long-chain streptococci, if used for human and animal consumption.

(4) It is found to be necessary to locate the infected cows by re-

peated microscopic examination of the milk of a herd from each and every quarter in order to maintain a negative herd.

(5) High doses of sulfanilamide prevent the presence of streptococcus in the milk but they reappear on the average of from 3 to 4 weeks after the sulfanilamide has been fed. By feeding sulfanilamide again the streptococci disappear for about the same length of time.

(6) Sulfanilamide is useful in acute mastitis.

Credit must be given to the following breeders who submitted their herds for experimental purposes:

W. R. Kenan, Randleigh Farm, Lockport, New York.

Hugh Bonnell, Youngstown, Ohio.

J. L. Hutcheson, Peerless Woolen Mills, Rossville, Ga.

Otto Kline, Raemelton Farm, Mansfield, Ohio (of the Black estate).

Jack Campbell, Clearview Farm, Butler, Pa.

J. B. Groves and Sons, Groveland Dairy Farm, North Jackson, Ohio.

[Editor's note: The federal government regards sulfanilamide as a poison and its sale is limited to permits.]

The Why and How of Lime

Condensed from Southern Agriculturist

E. J. Kinney

ON a very large proportion of farm land in the South, perhaps 85 per cent, the use of lime may be regarded as a fundamental requirement for successful agriculture. These soils are too acid to raise legumes successfully, and the growing and proper utilization of legumes affords the only practical means of furnishing most of the nitrogen required for good yields of general farm crops. Nitrogen can be purchased in commercial fertilizers but it is far too expensive to use freely except on crops which give large acre returns. It is true that fair yields of some legumes can be obtained on moderately acid soils Lespedeza, soy beans and cowpeas are examples of the more acid-tolerant ones. However, the yield of even these legumes is greatly increased by liming.

On moderately acid soil of limestone origin at the Western Kentucky Substation at Princeton, Kentucky, the yield of Korean lespedeza was increased 65

Reprinted by permission from the Southern Agriculturist, Nashville, Tenn., Oct., 1938

per cent over a period of 11 years by the use of ground limestone in addition to a phosphate fertilizer. On the quite strongly acid soil of the Fariston, Kentucky, Experiment Field the yield of soy bean hay was nearly a ton per acre more where limestone was used with a phosphate fertilizer than where the latter was used alone. Our most valuable hay and soil-building legumes—red clover, alfalfa and sweet clover—are very sensitive to soil acidity and can rarely be grown at all without the use of lime.

Liming acid soils also benefits directly some non-legume crops, particularly bluegrass, barley and such garden crops as cabbage, onions, beets, kale and spinach. In fact, on very acid soils it may directly improve the yield of all crops by increasing the rate at which plant nutrients of the soil, particularly nitrogen, become available. This is because liming makes more favorable conditions for the growth of soil organisms which cause the decomposition of organic matter.

Tests for Soil Acidity—There are a number of fairly satisfactory chemical tests which show whether or not soils are acid. Most county agents have the necessary equipment for making these tests. The most reliable method of determining the need of liming is to lime an acre or so and note its effects upon legume growth. On most soils of the South phosphorus is deficient and lime will be of little benefit on such soils unless used in connection with phosphorus.

What Materials to Use—In most areas ground limestone is the cheapest material to use for liming and the easiest to handle. In some areas deposits of marl provide a cheap source of lime equally as desirable. Burned and hydrated or slaked lime are satisfactory materials, but usually much more expensive to use than ground limestone. Fifty-six pounds of burned lime or about 75 pounds of hydrated lime are equal to 100 pounds of pure limestone for liming land. In areas remote from a source of ground limestone, burned or hydrated lime may be as cheap as the latter because of the saving in freight charges.

Amounts to Use—Two tons of ground limestone per acre is generally regarded as sufficient except on very strongly acid soils or where land is being prepared especially for alfalfa. In such instances three to four tons per acre may be required for best results. Very heavy liming, however, is not advisable. Some farmers, perhaps on the theory that if moderate amounts are beneficial, large amounts would be better, apply 8 to 10 tons of ground limestone per acre. Where such large amounts are used,

crop yields may actually be reduced because the mineral elements of plant food—phosphorus, potassium, manganese, etc.—may be made unavailable to plants. In addition to the possible reduction of crop yields, much loss by leaching occurs where very heavy applications of lime are used. It is particularly important not to overlime where tobacco is grown in the rotation. Heavy liming reduces quality and diseases are more prevalent. In using lime on land where tobacco is to be grown, especially Burley, not over 2 tons per acre should be applied and this should be used as far away from the tobacco crop as possible. Heavy liming is also injurious to potatoes, strawberries and some other crops.

Experiments are showing that frequent re-liming is not necessary where average initial applications are used. Except on very acid land, an initial application of 2 tons an acre and an additional ton every 8 to 10 years, will meet most liming needs. Before re-liming extensively, it is always advisable to test an acre or so to see if it is actually needed. Where money to purchase lime is limited, it is more profitable to make light applications, say a ton per acre, and cover as much land as possible than to use heavier applications on fewer acres.

Fineness of Ground Limestone—Numerous experiments have shown that lime ground fine enough to pass a 10-mesh screen (100 openings per square inch) is satisfactory where average amounts are used. Enough fine material is contained for immediate needs and the coarser particles are effective later. With very fine stone there is a heavy loss by leaching.

Lime Does not Take the Place of Fertilizer—It should be clearly understood that lime is not a fertilizer in the true sense of the word. It cannot be of much benefit on soils deficient in phosphorus or potash or any other mineral element of plant food. Its chief function is, as stated, to increase legume growth so that an adequate nitrogen supply can be maintained.

Smooth Brome Grass

Condensed from Farm and Ranch

Dr. W. B. Gernert

Forage Crop and Pasture Specialist, Oklahoma Experiment Station

WE have been securing good results with smooth brome grass, during the past five years at the Oklahoma Station. The grass in the large field has been growing four years and is not "sod bound."

I was first impressed with the grass at the Kansas Station during 1905 to 1907, where Prof. A. M. TenEyck had it growing well.

As much as 3 tons per acre in one cutting have been produced in Canada with smooth brome grass, with similar amounts on good land in Kansas. In ordinary years and on average soil, two to three cuttings of very good hay per season and pasturing year around in Oklahoma and Texas are possible. Watch your cattle, horses, sheep, and hogs fatten and thrive on it. Irrigation makes it grow all the better where this has been done farther west.

If and when it does become compact in growth, all that is needed is a disking or plowing, followed with a good cover of manure or if that is not available use limestone and phosphate in a rainy season and you will be surprised at the renewed vigor which the grass exhibits. Under such treatment it will far surpass most grasses.

Smooth brome grass will withstand heat, drought, cold, and poor soil after it is well started. The northwest values this grass for pasture and soil binding in terrace cuts and ditches.

It is very sweet and juicy, thus palatable to all livestock. It contains no poisons as do Johnson, Sudan, and sorghums at times. Investigators who have grown and used it for all kinds of livestock speak well of this grass. Its nutritive ratio is narrow, 1:5.8, with 4.2 per cent protein. The plant is leafy with slender stems. It is one of the best grazing grasses to be found anywhere.

The seeding rate is 14 pounds per acre which is the bushel weight also. Sow pure seed in the fall in Texas and Oklahoma, with spring seeding farther north. The seeds have a heavy chaff which does not feed through a common drill readily. Broadcast on a firm, moist seedbed free of weeds and disk just deep enough to cover the seed well.

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Nebraska's Program for Weed Control

Condensed from The Reclamation Era

George S. Round

Extension Editor, University of Nebraska College of Agriculture

THE Nebraska noxious weed-control program, based upon education, district organization, and prevention, is getting results.

It is through such a well-rounded program that farm and city people are recognizing the dangers of weeds and becoming vividly aware of the need to do something about it. The problem is being combated by a well-established educational program, by the organization of corporate noxious - weed - eradication-districts; by encouraging the eradication of noxious weeds, using approved methods; by prevention of new infested areas through control of infested seed and livestock feed; and by precaution in the use of crop-harvesting machinery.

Boosted along was the noxious-weed control by the enactment of a weed law by Nebraska's Unicameral Legislature in 1937. This legislation was primarily aimed at field bindweed, but also makes provision for control of leafy spurge, Canada thistle, and puncture vine. Furthermore, it enables the Director of the Department of Agriculture and Inspection to designate other weeds noxious as conditions may warrant.

This law created a State weed advisory committee to assist and advise the director of the State Department of Agriculture in the program of control of noxious weeds.

One of the most important factors in any program designed to encourage better farming operations and promote efficiency is education. Although the University of Nebraska College of Agriculture and its branches has for years carried on an educational campaign against weeds, the passage of the State law added vigor to this long-established program. Educational meetings have been conducted throughout the State with farm groups, community clubs, chambers of commerce, vocational agriculture classes, schools, and other interested groups. Generally, these gatherings have been arranged by county agricultural agents.

Interesting has been the fact

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that many farmers and landowners did not recognize bindweed and other noxious weeds when they saw them. Thus, the meetings were very valuable in establishing identity of noxious weeds which need to be eradicated.

Another supplement to the educational program has been the production and utilization of colored movie films showing bindweed and other noxious weeds, methods of eradication, and weed conditions in all parts of the State. In addition, as a part of the educational work, weed exhibits were arranged for the Nebraska State and county fairs in 1938. Co-operating were county agricultural agents, 4-H clubs which the agents sponsor, and the department of agriculture and inspection.

Weed tours and field demonstrations sponsored by the county agricultural agents have also been a part of the educational program. Farmers seeing successful eradication work actually in operation thus have been convinced and encouraged to carry on eradication practices on their own farms.

All agencies have co-operated in this vast educational work. Much information on weed identification and eradication has been distributed to farmers and grain and seed dealers. Educational material has also been distributed to practically every school in Nebraska. The State Department of Agriculture has published and distributed a bulletin, "Nebraska Weeds," which has become very popular. This bulletin contains illustrations, means of identification, and methods of eradication of common weeds. In many schools this bulletin is now being used as a textbook for agricultural classes.

Still another part of the educational work during the past year has been the comprehensive bindweed survey which is now being completed. Only through the cooperation of the State and Federal crop statistician, precinct assessors of the State, the Agricultural Extension Service, and the State Department of agriculture has this been accomplished.

Bindweed control in Nebraska is recognized as a community problem; hence the organization of legal weed-eradication districts as the second step in the Nebraska noxious-weed-control program. In Nebraska it is a well-known fact that the sale and loan value of land infested with bindweed is greatly reduced, cultivation increased, and the crop yield reduced from 10 to 90 percent. Sometimes even the land is abandoned for crop-growing purposes.

These facts have brought out the necessity for definite organization to combat bindweed. Under the Nebraska law, such dis-

tricts may be established by petition of 51 percent of the resident landowners or owners of 60 percent of the land in any contiguous body of land. After a survey has been conducted by the department of agriculture and inspection to determine the feasibility of organization, a hearing is held before the county board. The board at that time determines whether an organization shall be established.

A weed-district organization assures a district-wide eradication program. A certain percent of each portion of infested land within the district is treated each year, leading to complete eradication. All roads, railroad rights-of-way, ditches, and canals must be cleared at the expense of the controlling agencies.

These districts are administered by supervisors who are elected by the landowners themselves within the area. Organized districts receive the benefit of State supervision and co-operation. The costs are borne according to benefits derived. In most of the organizations, all landowners share in the organization and administrative costs. Each landowner, however, is responsible for his own eradication. The organization and administrative costs thus far have averaged in Nebraska from ½ cent to 2 cents an acre for the first year.

At present, there are 18 areas either organized or undergoing organization procedure in Nebraska. They vary in size from 9,600 to 365,000 acres. Approximately 1,200,000 acres will be under noxious weed district organization at the close of the summer of 1939.

The extensive work carried on last year was probably somewhat encouraged by the demonstrational weed-control plots of the State department of agriculture and inspection, the Nebraska College of Agriculture, and the U. S. Department of Agriculture.

Eradication

Methods of eradicating bindweed and other noxious weeds are those outlined and developed by the Department of Agronomy at the Nebraska College of Agriculture and the Nebraska Agricultural Experiment Station. Important information is also constantly derived from the Federal-State noxious-weed laboratories and particularly from the one located near York, Nebr.

Cultivation is regarded as the most practical and economical method if the infested areas are not too small. Cutting off the above-ground parts of the plant about every 10 to 12 days the first year forces the plant to continually draw upon its food reserves in the roots in the production of new growth. Fewer cultivations at less frequent intervals then are required the second year.

Originally, 20 to 30 cultivations were necessary for complete eradication. Cultivating at a depth of 4 inches seems to be most practical and economical.

A duck-foot cultivator with shovels overlapping 3 to 4 inches is the best implement for eradication work. Improvised tools with long straight blades, duck-foot shovels attached to corn cultivators and other attachments have also proven satisfactory. Cultivation costs vary, depending upon the type of implement and power used. The cost of eradication averages between $7.50 and $12 an acre over a period of two years.

Past experience discloses that even after a bindweed patch is destroyed, there is still the problem of new seedlings. Bindweed seeds have been known to stay in the ground 20 years and still germinate. Plowing the ground at greater depths once or twice a season will bring seeds closer to the surface and encourage them to germinate. A frequent cultivation will then destroy the seedlings.

Sodium chlorate has proven the cheapest and most practical chemical found for bindweed eradication. Best results in Nebraska have been obtained if it is applied in the fall months when there is a sufficient supply of soil moisture to cause the sodium chlorate to dissolve and leach downward. Three pounds of sodium chlorate to the square rod are recommended for average conditions.

On rich soil containing much organic matter, larger amounts are recommended. Most landowners in the Mitchell precinct district have used 4 pound per square rod and have secured good kills. Recent information shows that better kills are obtained if the ground is not disturbed before or after sodium chlorate is applied. The treated area should be left undisturbed the following season in order that the treatment may be fully effective. Applying the sodium chlorate in the dry form, when conditions are favorable, is preferable.

Preventive Measures

In addition to the methods described above, one other means of getting the noxious weeds is being used extensively in Nebraska—that of preventing infestation of areas. Under provisions of the State weed law, the sale of seed, livestock feed, and other material containing noxious weed seed is prohibited until it has been processed in such a way as to destroy or remove the viability of the weed seed. These regulations, along with other material, were distributed to owners and operators of elevators, mills, seed houses, and public sale barns for their information as well as to apprise their patrons.

Also, in past years many new infestations of bindweed were caused by threshing machines and combines carrying weed seed from farm to farm. Under the provisions of the State law, all harvesting machinery must be cleaned before being moved from a field infested with noxious weeds. Furthermore, printed copies of these regulations must be affixed to and remain upon every threshing machine or combine during the time it is operated in the State. Inspection work is carried on during the harvest season in an attempt to secure co-operation of farmers and machine operators in carrying out provisions of the law.

Such a noxious-weed-control program, based upon education, district organization, and prevention, is bringing real and tangible results to Nebraska and will continue to do so in the future.

Many New Uses Found for Milk

Condensed from Washington Farmer

RESEARCH into new uses for food products has advanced more than is sometimes realized. Consider the case of milk. The manufacturers of a fiber from milk casein which equals wool in virtually all respects and excels it in some is a practical reality. At a recent dairy meeting it was confidently predicted that natural wool in clothing would be largely supplanted within five years by the casein fiber, and that "milk suits" for men would then be standard, because of their lower cost.

A new field for utilization of more milk is seen to be in prospect as the result of research into the use of whey products as a radiator anti-freeze material. This development is the result of work done by Dr. N. S. Golding, of the dairy department of Washington State College. Minor refinements in the process yet remain to be made but at present the whey anti-freeze will resist temperatures far below any ever reached under natural conditions.

News comes also concerning the use of skimmed milk and potatoes in the manufacture of potato sticks or croutons, which contain on the average 30 per cent of skim milk solids.

Sauces and candies from whey are already being made, and but open the door to the possibilities which yet remain for the development along this line.

New types of cheese being made give promise of increasing the popularity and the consumption of cheese.

Experience in the Utilization of Farm Machinery for Greater Efficiency

Condensed from Agricultural Engineering

B. Gwynne Burr

IT is assumed that experience in the utilization of farm machinery for greater efficiency includes successful attempts to achieve efficiency, as well as those which were unsuccessful. It is also assumed that efficiency refers as much to the relation of equipment to cropping program as it does to the day-by-day use of the machines in the field.

For maintenance of our tractors we have a fairly strict routine. Each machine has a time clock or an hour meter, and certain operations listed in a record book kept on the tractor must be carried out every 50 hours; these and additional ones at every 100 hours, and still others at every 300 hours. Our tractor repair bill per year is low per dollar invested, as compared with the other tools we operate. We estimate it to be about 5 per cent of the cost of the machine per year. In 1938 our repair cost for all equipment, including parts and labor, was $2,615 for a machinery value of $21,782, or 12 per cent. Our feeling is that these figures show that the tractor is today about the only farm tool designed to stand up properly under severe service. It is certainly the only tool that we can overhaul carefully once a year and be reasonably sure that it will go on to the next overhauling without some serious breakdown, as our time-clock records show a negligible amount of lost time chargeable to tractor failure. This does not take into consideration the time spent in locating the "bugs" in the first few months production of a new machine, troubles that somehow never show up in the pilot models but which do seem to show up rapidly in field operation. We have had several cases of this in tractors and other machines, and may I say now that it is my feeling and that of other large machinery users in our vicinity that this class of trouble could be reported and corrected much more quickly if the users were not forced into the position of having their only contact with the designer through the sales department. One company whose tools we use has a service department and we have found it much easier

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to deal with and to get our ideas across to them than in those cases where we have to take our trouble to the man who sold us the machine and who hopes to sell more. Generally our comments and criticisms go no farther than his office because he has been told at a sales meeting that the machine is pretty close to perfection and he insists on believing it, at least until a superseding model is produced, after which he will admit anything in the hope of selling a new one.

The problem of the breakdown of machines during harvest is the most serious one that we have to face, because it is then that pressure is on us to do the job promptly, and of the tools that we use the most complicated and unreliable are the combine and the corn picker. By unreliable I mean that these machines fail in such unexpected and unreasonable ways that we have as yet found no way to protect ourselves adequately against them. To the discredit of their designers and builders these two tools give more trouble in their early use, say, the first season or two, than they do later on. This is primarily because whenever a weakness develops that we can correct we do so, strengthening the parts and guarding against future failure. A case in point is our experience with corn pickers of which we have three of the same make, two pull type and one mounted. One pull picker was purchased in 1931 and was operated each year, except one through 1935, averaging about 12 per cent lost time for repairs. In 1936 it was completely rebuilt and strengthened, and its lost time for repairs dropped to about 3 per cent for 1936, 1937 and 1938. In 1936 we purchased a mounted picker which lost 16 per cent for repairs the first year, 7 per cent the second, and went through the last one after a major rebuilding with 6 per cent. This fall we purchased a second pull-type machine of the same make as the first but quite different in design and supposed to be much better. It distinguished itself with a record of 15.5 per cent of repair time. In fairness, I must say that we were warned of some of the troubles we could expect, but by no means all of them, and this machine was supposed to have had a year's testing before production was begun.

After building pickers for ten years, this particular manufacturer does not seem to be able to build a more reliable one today than he did in the beginning.

In regard to combines, of which we have three, two 16-ft and one 12-ft, our experience has been about the same as with the pickers, except that the percentage of time lost is, in general, less than in the case of pickers. Here,

however, breakdowns, if severe, are apt to be more important than in the case of the picker. One can make an interesting comparison, whether significant or not, in considering that in our own case the cost new of a 16-ft combine is approximately one-fifth the average value of the crops harvested per year, whereas a picker is worth only one-fourteenth of the average value of a year's harvest. On this basis it would appear that a picker could be built to cost about twice what it does now, and, if properly built, it would still be a profitable machine to operate since its per-hour capacity would go up and its repair cost would come down to compensate for the increase in overhead. I understand that there has been for some time a movement toward precision-built machines on the Pacific Coast, and it seems time that they found a place in the corn belt.

Daily Servicing of Machines

Another problem that we have at all times is the matter of servicing machines for a day's run. Our records show that, on the average, this will amount to about 10 to 15 per cent of the time the equipment should actually be operating and observations indicate that most of this time is spent in lubricating. Here we feel that much progress could be made by a swing away from the high-pressure, small-volume automotive type of lubricating gun and fitting to a low-pressure, large-volume type. The clearances in most agricultural bearings can be measured with a ruler instead of a micrometer caliper, and it is ridiculous to use a lubricating system of the type now supplied. After eight years of experimenting we are using in our work a medium-fiber grease with a great clinging power of the type developed some years ago for use in tractor track rollers. It has proven very satisfactory on our own and neighboring farms and much more suitable than the buttery, standard pressure-gun grease that is generally used. Whenever we could, we have changed hydraulic fittings to low-pressure button heads with a great saving in service time. Unfortunately this can only be done where clearances are sufficient for the button-head coupling. What we would like to see is a series of small button-head fittings for ⅛-in pipe thread with a lever-type gun developing about 2500 lb. pressure. With the push gun it is often difficult to get into a position to give a straight push on the gun, and a push at an angle will often snap the nose off the fitting or, if it is a long one, break the fitting off altogether. The popularity of the lever type gun is increasing rapidly as cheaper models are being offered in combination bargains with a

bucket of grease in most implement stores, but so far no one seems to have thought of putting them out as standard equipment on a tractor or an implement.

In order to facilitate moving, to lighten draft, and to ease shocks on equipment, we have gone in heavily for rubber tires on many implements. Due to the fact that we do twice as much power work on other farms as we do on our own, long moves are sometimes called for. Due to state highway department width restrictions, it is not always possible to load some tools on a truck, and for short moves it would not save time to load even those that could legally be carried. Our use of tires on implements will undoubtedly increase as older units are replaced with new ones.

As to pneumatics on tractors we are still pretty much on the fence. We have one tractor so equipped, and, while the tires undoubtedly save fuel and wear and tear, there are many times when the tractor cannot be operated without chains, which are a nuisance and wear out rapidly. During sloppy weather, when picking corn, we use chains on the front wheels to keep them from clogging with mud and trash. The best solution to date for the one-tractor farmer seems to be to have both rubber tires and skeleton wheels, as the added cost of the skeleton wheels is little more than twice the cost of a set of chains and they will outlast chains many times. One thing we have learned from actual test is that rubber tires will pack the soil much more than skeleton wheels or tracks, to such an extent in fact that planter runners and drill disks will not pentrate in the wheel marks. I have often wondered why some tractor designer hasn't gone back 20 years or so and rediscovered the old crown-and-worm differential that always delivers full power to both wheels as long as the one trying to slip has at least 10 per cent traction. A modification of this drive has been used in a four-wheel-drive truck made in the East for over ten years, with apparently satisfactory results. Such a drive in a tractor would remove one big objection to the use of rubber by doing away with the necessity for chains in many instances. A four-wheel-drive tractor on rubber with this positive differential in each axle would seem to have possibilities, but since this type of machine steers like a blind horse when going forward and backs like an intoxicated crab, it might have its disadvantages from an operator's standpoint.

Plowing in Soil With a Draft of 1000 Pounds Per Foot

For plowing we are using three-bottom and four-bottom plows, and, after seeing some of the

draft figures in the Iowa bulletin, I often wish that our farm were west of the Indiana-Illinois line. The average draft of a plow per foot width given in the Iowa bulletin is about 550 lb. For the past two years we have been working with an average draft of 1000 lb. per ft. at 6½ in. depth and 2.5 mph., and, in one case of alfalfa sod plowing last spring, it went to 1520 lb. per ft. at 1.75 mph. This naturally makes plowing costs relatively high, especially if trash conditions materially cut down the time moving forward. We plow under all crop residues, no matter how much trouble they cause, and the clogging problem is the biggest one we have to face in this operation. High-clearance plows with the axles on top of the beams are *not* the complete answer, although they help; but the chief difficulty is in the failure of the rolling coulters to cut properly in the damp trash. Our experience with the U.S.D.A. self-aligning, concave disk-type coulter which we have used on one plow for a year indicates that it does a better job than anything we have tried. The shank is subject to breaking too often when used on heavy plows, but the development of a spring release or spring trip shank would cure this trouble. Due to the partial pointer action of the concave disk this coulter throws trash well down into the furrow and leaves the ground in good order for subsequent fitting operations.

For general seedbed preparation we alternate between the tandem disk harrow and the field cultivator with spring teeth. When speed and trash conditions do not govern, we tend to favor the field cultivator because of its greater working depth and better weed control in thistle-infested fields. The stiff-tooth cultivator will work to a somewhat greater depth than the spring-tooth, but it does not have its shovels as closely spaced, and, paradoxically, it tends to clog more with trash. The general set-up of our seedbed preparation tools and drills is such that we can pull one unit back of the general-purpose tractor, two units back of the small tracklayers, and three units back of the large tracklayers. This is done by means of multiple implement hitches, and provides a flexibility of equipment so that implements can be fitted to the size of the field being worked, or to the size of the tractor available for a job if the others are busy somewhere else. The use of these hitches means that we have to use hand-controlled instead of tractor-controlled disk harrows because of the difficulty in backing to straighten out the gangs. We can see no objection to this as harrows once set seldom have to be changed.

As regards tractor-controlled disks, it would seem reasonable to build them so that they straighten by moving forward instead of backward, then when they bog down, as they sometimes do, a lot of messy backing to straighten them would be avoided, and for ordinary going there would be no more backing with this type than any other.

Checkrowing Corn

When planting corn we now use the same type of four-row check planter used at Ames with the fertilizer attachment. In our neighborhood the 40 x 40-in. spacing seems to be the most popular. For some reason, the machine pictured in use at Ames was converted from a straight-wire type to crossover wire, and while our experience with this planter as originally equipped was reasonably satisfactory as to accuracy of check, we improved its performance by using the drum payout type of anchor stake. It seems a shame that methods bordering on the criminal have to be employed by an owner of a green and yellow planter to obtain attachments for a red and yellow one, but at any rate we have them and like them. On the farm north of ours they are operating three four-row crossover machines, each with its own tractor, simultaneously on a single wire more than a mile long and I leave it to your imagination to figure out what happens to their check when all three check heads hunt into step and out again as the tractor governors vary.

Speaking of long wires, we hold to the theory that for a single planter, after a certain critical length of wire is reached and passed, say, 80 rods and up, wire travel between trips remains constant, as the ground resistance of the wire becomes equal to or greater than the load of the checking mechanism. Our experience with wires ranging from 40 to 250 rods bears this out. Last spring we tried the use of a cultivator on the tractor while planting, cultivating a strip about 12 in. wide ahead of each planter shoe. It was found to be useful in breaking a crust caused by a heavy rain on a previously prepared seedbed, but due to the heaviness of our soil we do not see many possibilities in this as a substitute for a final fitting operation. The corn is cultivated with the four-row cultivator which has floating knee-action rigs equipped with sweeps or shovels as conditions require. Each rig has its own gage wheel which is an almost essential condition to the use of a four-row tool.

Operating Cost Figures

In spite of our soil type, which requires much more time for plowing and seedbed preparation

	Man-hours/Acre		Tractor-hours/Acre	
	Iowa '33	U.G.F. '36	Iowa '33	U.G.F. '36
Seedbed, plant, cultivate	4.22	3.92	3.6	3.6
Harvest	2.5	3.48	1.3	1.4
Total	6.7	7.4	4.9	5.0

than the lighter central western soils, the use of the larger mechanical units had kept our operations at an efficiency about equal to that of those recorded in the Iowa bulletin as shown by the following comparison for corn production.

The Iowa figures are for 18 acres and ours are for 200 acres, and I feel that our figures are truly representative, as we were not trying to establish any speed records but were merely farming along our usual way.

For wheat and beans the following figures show where large machinery units really come into their own:

	Man-hours/Acre	Tractor-hours/Acre
Beans 1936—170 acres	4.0	2.0
Wheat 1938—100 acres	3.3	1.4

I suppose that that part of our activities which attracts the most attention is the custom work that we do for our neighbors. Starting from a few combining jobs done as a favor as much as anything, it has grown to be the biggest part of our business, so that the tail now wags the dog. This work is no different from the work we do at home, but it has created several problems of its own. One of these is that we have a small pickup truck for each outfit we put in the field to carry the men to and from their work. Another is the matter of fuel and oil supply. We are using a small tank truck which visits each tractor once or more a day. The use of this truck means that all the diesel fuel is carried in one tight container instead of in cans where it would surely be exposed to dirt. I have already spoken of the part rubber tires play in our moving on the road.

To one who looks at the farm machinery industry today from outside, it would seem that most farm tools today are built down to a price, and as has been said so often, you get just about what you pay for. Not enough attention is being paid to the amount they eventually will cost the farmer in the way of lost time and repairs. In fact, I doubt if there is a single manufacturer of a general line of farm machinery who today has information as to the day-by-day performance record of his machines for a complete season.

Fenced Farming

Condensed from Capper's Farmer

Art M. Bolling

FENCING becomes productive equipment under the use F. F. Kothmann and his son, George, make of it in Wright County, Minnesota. Their entire holdings, more than 600 acres, are enclosed by woven wire. Livestock can be turned into any one of the fields under a 4 year rotation, which is of 60 years' standing, to pasture seedings, to salvage gleanings, to harvest crops or to clean up weeds.

Four classes of livestock, beef cattle, dairy cattle, sheep and hogs are kept to utilize the production of their diversified cropping system.

Sweet clover, sowed in regular rotation with corn and small grain, is the primary pasture crop. But it is supplemented with Sudan grass for summer, rye for fall and early spring, and alfalfa for fall or any emergency.

It was drouth which led to grazing alfalfa in the first place. Since then it has been included among pasture crops any time it is needed. They had sowed alfalfa with spring wheat in 1936. By harvest time practically all the alfalfa was dead, except in low places. Immediately after threshing in August they sowed alfalfa into the stubble with a disk drill without seedbed preparation.

Spring seedings of all kinds failed that year so they did not get the customary grazing from first year clover in stubble. The fall sown alfalfa offered welcome relief to a pasture shortage. It was grazed from October until winter snow and bad weather came after the holidays.

"We made a trial summer seeding of sweet clover that same season," said Mr. Kothmann. "Success of that stand encouraged us to adopt a July seeding date for a limited acreage of our clover. Up to that time we had depended on wild grass, stubble and other cutivated fields for sheep pasture. Now we are making the summer seeding of clover alone specifically for sheep."

The 100 ewes are bred for March lambing. They are wintered on shredded fodder and alfalfa hay or sweet clover if alfalfa is not available. A little grain is fed before lambing and during the early suckling period but not after lush pasture becomes available.

"Lambs themselves are prim-

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arily a roughage product," Mr. Kothmann explained. "Until 3 years ago we carried them on pasture with their dams until fall and then finished them in a cornfield where they grazed on pigeon grass and corn blades. But since we began using sweet clover 4 years ago, lambs have been developing to 80 or 90 pounds earlier and the cornfield range has become a less important factor in their production. The only grain we use is fed to a few tail enders and late lambs to hurry them along for finish ahead of winter."

Sweet clover also is used for pig pasture. One year they hand fed 63 head on a 4 acre lot. The grain ration consisted of a slop made of ground oats and whey, plus corn. They weighed 220 to 246 pounds at 5½ months old.

They use gilts for breeders. Most of them farrow around a strawstack of the previous summer, in May. Others are bred for July and August and drop their pigs on pasture or any convenient open field. Thus the primary factors of sanitation are served. Gilts produce but one litter and are finished for market after weaning their pigs.

To utilize pasture, roughage and grain they formerly maintained a Milking Shorthorn herd for both milk and beef production, but sold most of them in favor of Holsteins. Now they are swinging back to Shorthorns.

"In our experience, Milking Shorthorn cows will produce about as much milk as the Holsteins, altho they may not be quite so persistent," said Mr. Kothmann. "And not quite so great a proportion of the females develop into producers. But if a calf or a cow must be sold, the Shorthorn will bring more money. About 3 out of 5 of our Holstein calves grow into profitable cows whereas the Shorthorn proportion is only 50 per cent. If we can get tried sires the percentage can be increased somewhat.

"Beef is quite as important as milk to us and so we are changing back to the Shorthorns. We've tried topping Holstein cows with an Angus bull, and that makes a fair combination, but the calves must be marketed before they get leggy and wild.

"We've got a good illustration of that right now. Of 20 crossbreds, 5 are fall calves that never have been out of the lot. They were weaned as soon as milk was fit to use and bucket fed whole milk until they were 3 or 4 weeks old. They were given skimmilk another 4 weeks, during which whole oats were offered in a trough. When bucket feeding was discontinued they had a mixture of half ground corn and ground oats with alfalfa hay. Now, the last of July, they'll average 600 pounds. The other

15 won't weigh much more and they are a year older. The only way to make the dairy-beef cross-bred system work is to get them finished early, before they are a year old."

Both beef and dairy cattle are grazed on sweet clover but milk cows don't relish it, he asserts. That may be because Sudan grass, which is highly palatable, is provided. George has observed that cows will fill up on Sudan and then go lie down in the clover when they have access to both kinds of pasture.

Fall seeded rye makes the earliest spring grazing available for any class of stock and is ready as soon as the ground is fit. Second year clover becomes available about May 10. By the time it matures, in July, Sudan is ready and affords grazing thru August and September. First year clover in stubble, or seeded alone, with alfalfa aftermath provide grazing until snow flies.

Cows turned on Sudan at night come up in the morning with distended udders and milk like fresh heifers while lambs will grow fat on it.

"Under our rotation and the supplemental sowed pasture we can provide grazing for about 9 months," said Mr. Kothmann. "That is a long season for this far north. With good tight fence that will turn sheep and hogs as well as cattle, we are in position to use any field where grazing is available, whether it be much or little."

The rotation, 1 year of corn, 2 of small grain and 1 of sweet clover, together with the even distribution of manure by grazing animals, has made their land highly productive. They do not consider alfalfa a soil improving crop and so let it stand not longer than 4 years. Even then, Mr. Kothmann observed, a heavy manuring is necessary to make the field yield with the clovered land.

New Way to Lime

NEW lime spreading methods reduce time and labor required to a fraction of that needed when lime was hauled, unloaded in piles, reloaded and spread. William Hummermeier, Stephenson county, Illinois, had 600 tons spread on 160 acres at a total cost of $1.25 an acre. It was hauled to the farm in large, dual tire trucks and unloaded into a spreader attached behind the truck as it drove slowly thru the field. The only hand labor was that required to shovel it into the spreader. One man unloaded 55 tons in a day.—*Capper's Farmer*

The Care of Layers in Batteries

D. C. Kennard and V. D. Chamberlin

Department of Animal Husbandry, Ohio Experiment Station

POULTRYMEN contemplating the use of laying batteries should consider the advisability of beginning on a small scale first to see whether batteries prove a failure or a success under their particular conditions of operation. Morever, a modest beginning permits the poultryman to learn a primary essential—whether or not he likes working with layers in batteries. Some do and succeed; other do not and fail.

If a poultryman likes working with layers in batteries, and if he can meet the special requirements, such as weekly culling, a supply of suitable birds always available for replacements, adequate housing for batteries, proper ventilation for the battery room, and numerous other requisites, he should be able to succeed if too large-scale operations are not undertaken.

The operation of laying batteries on a large scale is attended by many unforeseen difficulties. The only reasonably safe approach to large-scale operation is starting and succeeding on a small scale first. After the first essential accomplishment, the next would be gradually to increase the capacity over a period of years, largely by means of self-capitalization rather than by the introduction of outside capital. In this way the large-scale operation of batteries for layers could be made a sound business venture.

It might seem that the feeding and watering of layers in batteries would be simple matters, but they have not been. Most problems of this kind become simple after a long-time experience of trial and error. Such has been the evolution of feeding and watering equipment, as well as methods of feeding layers in batteries during the past 10 years.

Feed and water troughs were first placed on the batteries crosswise so that each trough served four layers. These were quite satisfactory from the point of feeding, but were otherwise inconvenient and occupied too much valuable battery space. They were, therefore, abandoned.

Abandonment of these first feeders was followed by individual feeders in front of the cages; in some instances these individual feeders were divided into two or three separate compartments for whole grain, mash, and

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shells. The individual compartment feeders were not satisfactory. The next development was front feeders, with or without compartments, to serve 2 or 3 hens. Now, after 10 years of trial and error and experience with all types of feeders for laying batteries, satisfactory feeding equipment has been developed.

Feed troughs should be of no greater capacity then necessary to prevent wastage of feed. A feed trough such as is described has proven satisfactory. The width and greatest depth of the feeder are both 4 inches. The V-shaped bottom with the short side toward the battery makes the feed easily accessible. The other dimensions are: vertical side next to battery, 2½ inches; short side of V-shaped bottom next to battery, 2¼ inches, outer side of V-shaped bottom, 3¼ inches; and outer vertical side of trough, 2¼ inches.

Lips to prevent wastage of feed extend inward one-half inch with a ⅛-inch fold on the underside to make a smooth edge. The feeders are made of 26-gauge, galvanized sheet metal. Brackets support the feeders so that the inner top edge of the feeder is 7 inches above the wire floor.

The feed trough should be without partitions or compartments and should serve 4 to 10 layers. The length of the feed trough in this type of equipment is limited to that which can be handled with reasonable convenience, since it is generally necessary to remove the feed trough when a layer is removed or replaced.

At the Ohio Station watering equipment inside and outside the batteries has been tried. This equipment has included cups, wire loop drip waterers, and troughs, with and without drip water supply. The watering equipment now being used consists of galvanized sheet metal troughs which extend across the front of each tier of cages directly above the feeders.

The water comes by means of a drip from water under pressure or from a supply tank into the closed end of the top water trough and flows through the three tiers of troughs. Any surplus water finally flows down the drainage wire from the lower trough to the floor and passes through a drainage channel (about one-half inch wide and one-half inch deep) in the cement floor to the floor drain.

The water troughs are supported by adjustable brackets, and there are approximately 3 inches of clearance between the bottom of the water trough and the top of the feed trough. The water troughs are carefully leveled by means of the adjustable brackets to give the desired depth of water (one-fourth to three-eighths of an

inch). The water trough is made of 26-gauge, galvanized sheet metal and has a V-shaped bottom. The greatest vertical depth from top to bottom is 2¼ inches; the vertical sides are three-fourths of an inch high; and the sides of the V-shaped bottom are 2 inches. The top edges are made with ⅛-inch folds on the outside to give a smooth edge and added rigidity. Each trough is closed on one end (drip water supply end), but the drainage, or overflow, end is left open except for a small, sloping dam made by soldering in a triangular piece of galvanized sheet metal to retain a ¼- to ⅜-inch depth of water, as shown in figure 3. The dam slopes upward one-half to three-fourths of an inch from the inner point at the bottom, to facilitate cleaning. The outer edge of the dam extends to within 1 inch of the end of the trough. A piece of No. 11 gauge, galvanized wire is soldered into the V bottom at the end of the trough just outside the dam and extends 1 inch beyond the end of the trough. This extension is bent upward so that the drainage wire to the trough below can be attached. The drainage wire which carries the water from one trough to another consists of a No. 11 gauge, galvanized wire with a narrow loop on the top end which hooks over the wire extending from the drainage end of the water trough above. The drainage wire extends to within one-fourth of an inch of the bottom of the lower trough. The lower end of the wire is bent slightly toward the end of the trough to keep the wire about one-half inch from the top end so that all the water will be carried into the trough. The ends of the water troughs extend 1 or 2 inches beyond the ends of the feed troughs so that the drainage wires can pass from one water trough to the other below without contacting the ends of feed troughs. Otherwise, some of the water might drop into the feed trough. When the feed and water troughs are of the same length, the drainage wires can be curved outward in order to avoid contact with the ends of the feed troughs, but this is not altogether satisfactory.

The type of equipment described is intended primarily for modernizing feeding and watering equipment of old laying battery installations, such as that in use at the Station. Some of the new designs of laying batteries are already provided with satisfactory feeding and watering equipment.

Rations for Layers in Batteries

Tests carried on at the Station indicate that coarse all-mash or whole grain and mash rations can be used with equally satisfactory results. A single feed mixture is convenient and requires less skill to use. The whole oats—mash

mixture now being used by the Station is composed of the following ingredients:

	Per cent*
Yellow corn, coarsely ground	20
Whole oats	20
Ground oats, medium fine	10
Wheat middlings	20
Wheat bran, coarse	10
Meat scraps, 50 to 55 per cent protein	7
Soybean oil meal	2.5
Dried skimmilk	5
Alfalfa leaf meal (dehydrated)	5
Salt	0.5
Cod-liver oil (85 units of vitamin D)	1
Oyster shells	5
Granite grit	2

*Not including cod-liver oil, oyster shells, and granite grit

This appears to be the best ration for layers in batteries yet employed. It is an all-inclusive feed mixture, even including oyster shells and grit.

Methods of Feeding

Fresh feed is given morning and evening in the amount that will about be consumed before the next feeding period. The feed is redistributed before the birds midforenoon and midafternoon, which practically amounts to feeding four times daily. The use of continuous feeders (without partitions or compartments) each accommodating 4 to 10 layers and the redistribution of the feed are important in the feeding of layers in individual batteries. No two hens eat the same amount of feed, and the individual consumption of whole oats, oyster shells, and grit varies greatly. This individual variation has presented one of the most difficult problems in the feeding of layers in individual cages. The continuous feed troughs and the midforenoon and midafternoon redistribution of the feed have proved the most satisfactory solution of that problem.

A layer in high egg production may have all the feed within reach consumed by midforenoon or midafternoon, and with redistribution of the feed she gets a chance to share the surplus feed, whole oats, shells, or grit not consumed by her neighbors. For example, the layers in the highest rate of egg production probably need, and certainly will often consume, more oyster shells than 5 per cent of the total feed. With redistribution of the feed twice daily the best layers get a chance at the shells not needed by other birds. It is a comparatively simple matter to feed 4 to 10 layers as a unit; whereas catering to the individual requirements of birds, as is necessary when individual feeders are used, becomes needlessly difficult and time consuming.

Livability and Egg Production

Layers in batteries have rendered a favorable account of themselves in both livability and egg production in all the experiments conducted by this Station since 1924. During the past 5 years pullet layers in batteries have been tested in direct comparison with pullets in floor pens.

Since livability of pullet layers has of late years become the question of greatest concern, how did the layers in batteries behave in this respect as compared to similar pullets in floor pens? Here the battery layers won a high score. In only 2 of the 25 tests did the loss of pullets in the battery groups exceed that in the floor pens. The average rate of mortality (including culls) of the layers in batteries in the 25 tests was 37 per cent; that of similar pullets in floor pens was 51 per cent. There was little difference in egg production. In 13 of the 25 tests the pullets in batteries laid more eggs than the pullets in floor pens. The average for the 25 tests was 7 eggs per bird[1] in favor of the pullets in batteries.

From these results it would seem that in so far as the behavior and performance of the layers in batteries are concerned, the question of success or failure with layers in batteries is largely to be determined by the caretaker, his management, and whether or not he can meet the special requirements of keeping layers in batteries.

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1 Computed on the basis of the original number of pullets at the beginning of the tests.

Pellagra in Pigs

Pigs on a too-exclusive diet of corn get a disease resembling the pellagra to which humans on the same kind of diet become victims, and they can be cured with the same substance, nicotinic acid. This has been demonstrated in experiments at the Lister Institute, London, and at the Institute for Animal Pathology in Cambridge, by Dr. Harriette Chick, Sir Charles Martin and a group of collaborators. Young pigs kept on a "straight" corn ration for three or four months were almost at the point of death, with all the repulsive symptoms of advanced pellagra, when they were given injections of nicotinic acid. Recovery began within twenty-four hours, and within six week normal health and appetite had been restored.—*Science Service*

Combating Cabbage Black Rot

Condensed from Texas Farming and Citriculture

Dr. G. H. Godfrey

Plant Pathologist, Texas Experiment Station, Hidalgo County

CABBAGE in South Texas is one of the big pay crops. The Texas crop supplies the Northern markets with a fresh green vegetable in the middle of winter when the housewife is "fed up" with the storage article. Texas is the Number One green cabbage producing State.

Yet, in spite of the store of information that is constantly being disseminated on the matter, "black rot" continues to take a heavy toll, thereby reducing farmer prosperity, and farmer prosperity is essential to business prosperity.

Black rot is a seed-borne bacterial disease. It manifests itself first of all in the seedbed and later in the field, as a yellowing of lower leaves, particularly in leaf margins, a distinct blackening of the leaf vines in the discolored region, and a twisted and distorted growth. These black veins are full of the bacteria. As the plant grows, the bacteria continue to develop, and with their rapid increase in numbers, travel downward to the stalk of the plant and into the stalk. Here, they continue to develop, get into the water tubes in the stalk, causing their blackening, and then upward into the head, causing it eventually to go down in a rotten mass.Black discoloration in the stem is a sure sign of the disease.

All this is the progress of the primary infection, which got started directly from organisms that were carried on the seed. Secondary infections take place on a lot of initially healthy plants in the row, by direct contact of leaves with soil that has gotten contaminated from diseased plants, and by the splattering of infested soil up onto the plants. Here, the disease may go through the same course of development as in plants diseased from the start. Sometimes, when the infections occur late, only a few outer leaves are affected. The blackish lines in the leaf veins are unmistakable symptoms. Infestation with cabbage worms will carry the disease still further, down into layer after layer of the covering leaves. Buyers will usually turn down all heads that show

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the slightest trace of infection in the outer leaves.

The question arises: How did the disease get started? If the disease is seed-borne, how did it get into the seed in the first place? The course of development on the seed-producing farm is really much the same as in the commercial cabbage field. Instead of spreading up into the head, as in the cabbage field, the infection spreads into the flowering stalk, and actually into the flowers and seed pods, and onto the seed coat. In a rainy season, this type of infection in the seed may be very heavy. The disease is almost universal, in greater or less degree, though it is likely to be much worse some seasons than others.

The only seed growing section in America that produces relatively disease-free cabbage seed is western Washington. There they have abundant winter moisture without excessive cold, which enables the plants to develop a good root system; then a dry summer, which completely discourages the spread and development of the disease in the seed heads. Most eastern grown seed, and probably all European grown seed is likely to be infected with the black-rot bacteria, for the frequent summer rainfall favors the disease. The seed is perfectly good, but it is more than likely to carry this loss maker, the black rot disease.

In a 1937 source-of-seed planting at the Lower Rio Grande Valley substation, European and eastern grown seed, non-treated, produced up to 40 per cent heads that were unmarketable due to black rot. Washington seed averaged only about 1 per cent unmarketable.

That cabbage seed should practically always be treated by the grower was proved in the 1938-39 season in the Lower Rio Grande Valley, by a number of interesting circumstances. In not one but many cases, the grower did not treat his seed because he was told by the seedsmen that the seed did not need treatment.

Either the seed (or a part of it) had come from a supposedly disease-free section, or it had already been treated, with some inadequate dust disinfectant. In not one but many cases, the result in this bad black rot year was a severe outbreak of the disease, which resulted in losses as high as 75 per cent, and in some even 100 per cent. In one case under the direct observation of the writer, the crop was ready to harvest in a high-price season, but the grower received only $32 for his crop when he should have received $300.

The loss was practically 90 per cent. Another seedsman, to the writer's knowledge, actually responded to a telegraphed message of inquiry, that the seed positive-

ly did not need treatment. The result, 50 per cent loss in red cabbage and 75 per cent loss in All Head Early, and this on virgin land.

Many other similar cases could be cited. In the same season, and with exactly the same source of seed, the local seedsmen, the 20 acres more or less of cabbage on the Experiment Station fields showed absolutely no black rot. The seed was all treated just prior to planting.

And now, just exactly what is meant by the proper seed treatment for cabbage to prevent black rot? Up to the present time, nothing better has been devised than the old standard half hour's immersion, in a loose cloth bag, in the 1 to 1000 (1 ouncce to 7½ gallons of water) mercuric chloride ("bichloride") solution, followed by quick rinsing in clear water, then spreading out to dry. One bichloride tablet, as obtained from the drug store, to the pint, or eight of them to the gallon, will make a solution of the right strength. Glass, stone, granite, or wooden vessels should be used for holding the bichloride solution; definitely not a metal container.

Actually the best stand in the seedbed (least seed injury) is obtained when the seed is planted immediately (the same day) after the seed is surface dry. Injury and reduced stand is sometimes sustained if the seed is permitted to become completely dry by delaying planting for several days.

If the seedsman would co-operate with the grower by supplying him with explicit directions for seed treatment and urging upon him the advisability of treating his seed, both seedsman and grower would probably be ahead in the long run.

Factors Affecting the Value of Feeds

From Feeds and Feeding, Abridged

F. B. Morrison

WHEN does preparation of feed increase its value? It is of much financial advantage to stockmen to know whether any particular method of preparing feed for farm animals is actually profitable. Extravagant advertising claims are sometimes made concerning the supposed savings that will result from a certain method of preparing feed. Before spending money for equipment, it is therefore highly important that a farmer have unbiased information on this subject.

It is often assumed that by grinding or chopping feeds much labor is saved the animal, and the production therefore increased decidedly. This idea is based on the theory that the less work the animal does in mastication and digestion, the greater will be the amount of nutrients left for useful production.

However, this is apparently not true. The muscles of the body do not grow strong through idleness, and activity and exercise are necessary for health and strength. Likewise, the organs of mastication and digestion should be kept working at their normal capacity. Making feeds so fine and soft that they can be swallowed with little chewing, not only fails to pay for the cost of such preparation, but it may actually lower the value of the feed.

The value of grinding, crushing, or cutting feeds depends on the character of the particular feed in question and also on the kind of animal to which it is to be fed. Therefore the economy of these methods of preparing feed for each class of stock is considered in detail in later chapters. In this chapter there are discussed only the general principles that apply to the various classes of feeding stuffs and to the different kinds of livestock.

In some cases, feeds that are unpalatable to stock will be consumed readily if they are ground and mixed with those that are well liked. For example, rye gives better results with most classes of stock if it is mixed with more palatable grains.

To induce animals that are being fitted for show to consume a little more feed than they might otherwise, the grinding of grain, the chopping of hay, or the soaking of feed may sometimes be

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helpful, even though the expense of such preparation would not be justified for other stock. There will naturally be more saving in grinding feed for animals with poor teeth than for those that can chew their food normally.

Grinding grain or other seeds. In the case of grain or other seeds, grinding, crushing, or soaking is usually profitable only when the particular animals fail to chew the seeds thoroughly. Seeds that escape chewing may pass through the digestive tract without appreciable digestion, and thus the nutrients are lost. Whether it will pay to grind grain for any class of stock is therefore a problem that can be determined only by feeding experiments.

Such preparation may be advisable for very young animals, before their teeth are well developed, but later it may not be beneficial. Also, in certain instances animals chew their feed less thoroughly as they grow older, and the grinding of grain is then advisable, even though it may not have been worth while for the same animals when somewhat younger.

For example, after they are a few weeks old, calves chew corn or oats thoroughly up to about 6 or 8 months of age, and there is hence no advantage in grinding these grains for them. After this age, it usually pays to grind the grains. Similiarly, growing and fattening pigs chew corn with such thoroughness up to the usual market weights, that it does not generally pay to grind it for them. However, older pigs chew corn less thoroughly, and therefore the saving through grinding is greater.

All grains should commonly be ground for dairy cows. Grain should also be ground for beef cattle, with the exception that it does not pay to grind corn for them if pigs follow the cattle to salvage the unmasticated corn kernels in the manure. All grains except corn and oats should be ground or crushed for horses and mules. In general, sheep chew their feed the most efficiently of all the larger farm animals. As a result there is generally no advantage in grinding grain or other seeds for them, except in the case of seeds that are unusually small or hard.

Fineness of grinding; crushing or rolling vs. grinding. Grain should be ground only to a medium degree of fineness for stock. In other words, it should be ground so that it is gritty, and not mealy or floury. Fine grinding not only takes more time and power, but it often actually makes the grain less palatable.

The cost of grinding is somewhat less when grain is merely cracked than when it is ground to a medium degree of fineness. However, the utilization of the

cracked grain is enough lower to make medium-fine grinding preferable. When grain screenings, which consist to a considerable extent of weed seeds, are fed to stock, many of the smaller seeds may pass through the digestive tract unchewed and alive. Fine grinding of such screenings is therefore desirable to prevent infesting the fields with weeds through applying manure that contains live weed seeds.

Many horsemen prefer crushed or rolled grain to that which has been ground, because the former is more bulky and perhaps somewhat less apt to cause colic. For other classes of stock there is probably not much difference in the value of grain which has been crushed and that which has been ground.

Grinding or cutting hay or other roughage.

In the case of hay, stover, and straw, there are no hard seed coats to be broken. Therefore the ordinary chewing by livestock tears the forage into particles that can readily be penetrated by the digestive juices. Hence, additional expense for grinding or cutting of such roughages is usually advisable only if it induces animals to eat coarse, stemmy portions that they would otherwise waste; or if they will consume a greater total amount of the roughage than when fed without the preparation.

In general, for dairy cows, beef cattle, and horses, it does not pay to cut or grind hay of such quality that it will be consumed with but little waste. If the long hay is not fed in mangers that prevent undue refuse, there may be considerable saving in cutting or grinding it. For example, in the West fattening lambs are commonly fed in open lots, and the alfalfa hay is frequently put on the ground, simply being rolled up against the fence of the feedlot. Under such conditions there is a considerable wastage and therefore cutting or grinding the hay makes a sufficient saving to justify the expense.

If hay is coarse and stemmy or otherwise of poor quality, there is more advantage from cutting it than with hay of good quality. Not only will the wastage be reduced, but also the stock will usually eat a greater amount of such roughage if it is cut.

In the case of corn or sorghum stover, it usually pays to cut or shred it to lessen the refuse, and also because the waste is then much better for bedding. Cut, shredded, or ground stover or fodder will heat or mold in storage unless thoroughly dry. For this reason, in humid districts such roughages frequently cannot be kept for more than a few days, even in cool weather.

For cattle and horses cutting hay is preferable to grinding it.

Not only are much less time and power required to cut it by means of a silage cutter or a special hay cutter, but also the cut hay is actually more desirable than hay ground to a meal. The ground hay is often so dusty that it is disagreeable to handle in the barn, and it is often less palatable to stock than cut hay. In addition, the fine grinding of hay does not increase its digestibility for cattle, and it may even decrease it.

If it is desired to feed corn fodder to cattle without removing the ears, or to feed sorghum fodder without removing the heads, it may be desirable to grind the fodder in a roughage mill that will crack most of the grain and prevent it passing through the animals unchewed. However, the crop generally has a considerably higher value when fed in the form of silage instead of as ground fodder.

Recently many farmers have adopted the practice of chopping hay as it is stored in the barn by running it through a silage cutter or a special hay cutter, equipped with a blower. This method of handling hay is discussed in Chapter XI.

Mixing cut or ground roughage with concentrates.

Claims have often been made that the value of a ration will be greatly increased if the roughage is cut or ground and mixed with the grain or other concentrates. In spite of these claims, experiments have shown that such mixing of the feed does not generally increase its digestibility or its nutritive value. Farm animals have digestive systems which mix very thoroughly the feeds they eat.

However, in special cases the mixing of roughage with grain may be desirable from other standpoints. For example, horses are apt to have colic if fed a heavy grain, such as ground wheat or barley, as the only concentrate. Mixing with the ground grain a small proportion of a bulky feed, such as chopped or ground hay, ground oats, or wheat bran, will largely prevent the trouble. Lambs fed a very liberal allowance of a heavy feed, like corn, so that they will fatten rapidly, often suffer from digestive troubles. Mixing chopped or ground hay or some other bulky feed with the grain aids in preventing such difficulties.

It is highly desirable, when pigs are not on pasture, that they eat some legume hay to provide vitamins A and D. If legume hay, even of good quality, is fed uncut in a rack, young pigs will frequently not eat any appreciable amount. It is therefore advisable to mix about 5 per cent of chopped or ground legume hay in their concentrate mixture in order to force them to eat it.

Cooking feed.

Many years ago it was firmly believed that cooking or steaming feed greatly increased its value. Careful trials have shown, however, that in general such preparation of either grain or roughage does not increase its digestibility or its nutritive value, and it may decrease the digestibility of the protein.

Though cooking feed for cattle was abandoned years ago, it is still occasionally done for swine. However, numerous experiments have shown that instead of there being a gain from cooking feed, there is a loss in most cases. The only exceptions are a few feeds, such as potatoes and field beans, which can be fed satisfactorily to swine only when cooked. Soybeans also give better results in swine feeding when cooked, and soybean oil meal which has been thoroughly cooked in the manufacturing process is preferable to raw-tasting meal for swine.

Soaking feed; feeding slop.

When grain with small or hard kernels cannot be conveniently ground or crushed, it may be advisable to soften it by soaking before feeding. Care should be taken that such soaked grain does not become stale by long standing. Old corn often becomes hard and flinty in summer and sometimes causes sore mouths in cattle or other stock if fed whole. It should then be ground or soaked.

Many farmers still feed ground grain and other meals to their hogs in the form of slop, believing that slop-feeding produces much better results than dry-feeding. However, just as satisfactory results are generally secured when the same feeds are given dry, and much labor and bother are saved.

Fermenting, pre-digesting, malting, or sprouting feeds.

From time to time various processes of fermenting, malting, or pre-digesting feeds have been exploited by clever promoters. Claims have been made that these processes would save one-third to one-half the feed usually supplied livestock and would result in even better production than normal rations.

In these methods the roughage is chopped, treated with a solution containing the "converter," and then allowed to remain in a tank or other container for several hours, where it undergoes fermentation. In some of the methods the concentrates must be mixed with the chopped roughage. Careful experiments with dairy cows, fattening cattle, and work horses have shown that these expensive methods of feed preparation do not cause any saving in feed or result in greater production.

Recently, a method of sprout-

ing grain has been advertised as "an 8-day method of growing succulent, nutritious livestock food in cabinets without the aid of soil or sunlight." The grain is first soaked and then sprouted on trays in a cabinet, a nutrient solution being supplied.

It has been advertised that in this process 10 lbs. of corn grain will "grow to 40 lbs. of health succulent food." However, this increase is due to the increase in water, and is not an increase in dry matter. Indeed, in English tests there was a loss of 25 per cent of the dry matter of the grain in the process, instead of a gain. Organic matter can be formed in plants only through the action of sunlight on the green-colored chlorophyll, and in this process the plants are sprouted in the absence of sunlight. In the English tests sprouted corn grain was worth no more for dairy cows than silage or green kale.

Sprouted oats, which have sometimes been recommended as a cure for sterility in cattle, did not prove beneficial in most tests. The purchase of equipment for sprouting grain does not therefore seem wise, unless at some future time impartial investigations have definitely proven that such feed is superior to the common stock feeds.

The above is an excerpt from "Feeds and Feeding, Abridged" by F. B. Morrison, which we recommend especially for high school students. It includes a chapter on poultry which the standard work does not include. It is published by the Morrison Press at $2.75. For the convenience of our readers it may be purchased through the Farmers Digest.

Methyl Bromide as a Fumigant

Condensed from Pacific Rural Press

METHYL bromide, the amazing fumigant introduced to the United States in 1936 by D. B. Mackie, of the California Department of Agriculture, has a new victory to its credit.

More than 1500 cars of pears have been given an inexpensive bath of methyl bromide gas this year, disposing of the invisible codling moth worms, and causing the pears to ripen much more evenly and satisfactorily.

Both canners and shippers of pears are enthusiastic about the new method of treatment.

The treatment of pears is readily done. After the pears are wrapped and packed and loaded

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in the refrigerator car, methyl bromide is introduced in the car. It gasifies and the air is stirred up with a fan. It is not necessary to have the gas under pressure, nor is it required that the car be calked. Any good-condition refrigerator car is a proper chamber in which to do the treating. Cost is only about $3.25 per car.

The methyl bromide gas penetrates the calyx and follows up the codling worm. Receivers of shipping pears are happy about the even ripening of the fruit. Worms, of course, hasten the ripening of infested fruit. The methyl bromide gas kills the worms and prevents this sort of experience.

Observers are very enthusiastic about the new use of methyl bromide, and call it a great discovery. They expect much wider use of the method next year.

Back in 1936, when Scientist Mackie first announced his experiments with methyl bromide, it was thought of as a fumigant for nursery stock, where it is a very effective agent, easily penetrating the soil or moss around roots.

Then it demonstrated its value in fumigating potatoes, tomatoes, and other possible carriers of troublesome insects. The ability of the gas to follow up the worm into its burrow, was an improvement over other methods. The potato tuber moth yields readily to the methyl.

It is used for nuts and dried fruits.

It is the best lethal dose for the ground squirrel. 10 cubic centimeters of methyl bromide to a runway, gets the squirrel and is useful in control of bubonic plague, because it kills the fleas on the squirrel, both adult and in the egg.

Grain warehouses and mills use it.

One grain mill cleaned out its insect infestation, treating 680,000 cubic feet with 680 pounds of the methyl bromide. The material at 70 cents per pound thus cost less than $500 for a big job.

In the East methyl bromide is being widely used for the Japanese beetle and the white fringe beetle.

In Arizona they are fumigating baled hay to kill a new alfalfa weevil.

Incoming Hawaiian papayas are fumigated with methyl bromide.

It is an effective fumigant for overwintering codling moths, by gassing the fruit boxes. Sometimes 100 or more of the codling pests are found in one box.

The methyl bromide is a liquid with a low boiling point, thus it readily gasifies. Very little of it is absorbed, and its residues are inorganic, and non-poisonous.

Cost Accounting for the Feedlot

Condensed from Hereford Journal

Carl R. Turner

Manager, Oakland Stock Farm, Columbus, Ohio

IT has been said that the navigation instruments of any business being operated for a profit are its books of accounting. In other words, it has long been known by successful businessmen that it is only possible to steer a profitable course by keeping an intelligible system of records. A company's past history as shown on the books enables its owners to discover and analyze their mistakes thereby enabling them to more surely plan for the future.

If there is any particular place in the beef industry where "cost accounting" should play a prominent part, the feedlot is that place. The average value of equipment and livestock in an ordinary feedlot would represent more wealth than the average small store with its stock of trade on the shelves, and yet, it wouldn't be surprising if the results of a survey made among a cross section of the nation's feeders would show that not more than one out of 100 livestock men keeps any intelligible record of his costs of feeding.

If one stops to think about this problem it would seem logical to assume that the feeder has been greatly responsible for any undesirable position he might find himself in today simply because he has not advanced beyond rule-of-thumb methods of doing business. If industry had continued to follow that type of program it indeed would still be back in the horse-and-buggy era.

When the average feeder is dealing with a representative of any packing company, why is it that the feeder senses a certain feeling that the buyer has it all over him? The buyer seems so sure of himself while the feeder "hems and haws" around, never quite certain as to whether he is getting the worst end of the deal or not. The buyer knows his company's costs down to the fraction of a cent. He can tell at first glance what that particular bunch of steers will do for him from a dollar-and-cents standpoint. The feeder on the other hand has had those same cattle under his watchful eye for from three months to a year and still he isn't quite sure what they have cost him. Who is naturally going to

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get the better end of the deal?

One year the feeder might readily sell to the company's buyer for 11 cents a pound, less 3 percent shrink, and actually lose several hundred dollars on the deal. On the next bunch he might have turned the buyer down when offered 10 cents, less 3 percent shrink, with conditions such that yet he would have made a neat little profit out of the deal. At the end of the year the feeder is greatly surprised because he has a lot more or a lot less money in the bank than he thought he would have.

To properly operate a cost accounting system in the feedlot, certain tools are fairly necessary. Small platform scales or measuring baskets to weigh or measure feed and any pad that can be ruled to suit the operator's individual needs are essential.

Having discussed the needs for making use of a simple cost accounting system, the next step is to discuss the technique of handling such a system. To do it would seem best to follow out an actual case record, explaining it as the article progresses.

The average period of feeding out cattle would probably be from 120 to 150 days, therefore, this article will consider an actual case of 37 head of long-aged yearling Hereford steers of medium to good quality. These steers were purchased in Kansas City Nov. 1, 1938, and sold March 25, 1939. They were in the feedlot 141 days in all.

For the purpose of keeping a cost accounting record of any group of cattle to be fed there are three phases to consider: The cost of purchasing the cattle and their transfer from the place of purchase to the feedlot. The second phase is the actual feeding out. The third phase is the sale and delivery.

Cost of Acquiring 37 Head:

Cost $7.75 per cwt. at Kansas City	$2,164.58
Commission, freight, trip expense, etc.	197.83
Total initial cost laid down at feedlot	$2,362.41

	Average
Kansas City weight totalled 27,930 lbs.	755 lbs.
Feedlot weight upon arrival 25,975 lbs.	702 lbs.
Loss of weight equalled 7 percent 1,955 lbs.	53 lbs.

In order to make such a system of any value for future reference, all possible technical factors should be stable. In other words, we must start this record and all other records from scratch by beginning the feeding-out phase using the weights at the feedlot or at the most accessible near-by scales immediately after arrival if possible.

By dividing the total initial cost of $2,362.41 by the weight upon

arrival we find that the steers actually cost us $9.12 per cwt. That in itself was quite an eye opener to the author. By rule of thumb he had estimated that those cattle would be laid down at home for approximately 96 cents per cwt. The actual cost was $1.37 per cwt. Forty-one cents per hundred isn't a mistake to be glossed over lightly.

Every group will shrink differently and your final accounting will be affected accordingly.

We are now ready to start out on the morning of November 3, 1938, with 37 good-to-medium Hereford yearlings costing $9.12 per cwt. laid down in the lot. The next accounting factors that should be kept stable are the methods of figuring the cost of feeds and labor. Since very few feeders keep any accurate production costs on their grains, the most sensible way to keep the feeding costs comparable throughout the years is to use the market value of the particular grain at the date of starting each new bunch of feeders. In this instance, on November 3, 1938, corn could have been sold at 45 cents per bushel to the local elevators. So long as no corn is purchased on the outside market for these 37 head any change of price on the market during the feeding period will have no effect. That particular batch of corn will stay at 45 cents.

Theoretically the corn was sold to the cattle on November 3. If, however, before they are sold more corn is needed and has to be purchased at 50 cents per bushel (or higher or lower), then from that date forward the charge against the cattle will be 50 cents or whatever price was paid for it. This same method holds true for figuring all other grains, hay or straw used. If supplements are used and the prices vary from purchase to purchase then each new price must be used as the preceding batch is consumed.

No matter what the actual method of payment happens to be in any particular instance, labor should be computed on an hourly basis. If you are working for yourself, put down what you feel your income for the week should be. Next, figure the average number of working hours you feel that you put in per week on all your farming activities. Divide your weekly pay by your weekly working hours and the result will be your hourly rate. Do the same for any other help hired on a weekly basis. Be sure that you use averages and don't attempt to change the computations each month.

This discussion about labor has been elementary. It is expressly set forth here, however, because so many feeders will say, "Why figure labor? Labor will offset the value of the manure received." In

some cases the manure will be of far more value than the labor while in other cases it will be of less value. It all depends upon the conditions existent—location, labor rates, methods of handling the manure, etc. If the manure must be made to offset something of value, let it offset items that would take a score of statisticians to figure out such as taxes, depreciation, obsolescence and other items of overhead.

The simple type of cost accounting used in the case being explained here is done on a printed pad of perforated sheets lined for the necessary details. Each sheet is a monthly record by days of a particular group of stock. Each line is a complete daily record.

The first step in keeping the record is to fill in the heading of the sheet each month with the number of head, a brief description, and the month. The next step requires the necessary data concerning the purchase and transfer. This will be put at the bottom of the reverse side of the sheet under the proper headings.

If you have a scale of your own or if an accommodating neighbor will allow you to check weights upon arrival, put the home weights down on the first line titled "Group Weight." If no scale is available, use the weights at origin of purchase. Under "Remarks" put the total initial cost, amount of shrink and any other data of interest for future reference.

Put down the cost of the various feeds, minerals and bedding to be used and list them in the middle column.

Due to the fact that the daily mixing and figuring of feed rations are in pounds and bales, it is a good plan to jot down at the head of each feed column, the cost per pound or bale. For instance, at 45 cents per bushel, ear corn would cost .006 cents per pound; shelled corn, .008 cents. Ensilage at $3.50 per ton would figure to .0018 cents per pound, etc.

All labor of handling the cattle as well as feeding them is totalled and listed under the labor column each day. Three places are ruled off for each day in the event more than one person has tended to the cattle for that day.

On November 3, 1938, the herdsman spent 2½ hours with the 37 head. He gave them six bales of hay at 50 cents per bale and bedded them down with 34 bales of straw at 25 cents per bale. At the end of the day he took less than five minutes time to jot down on the third line under the "Hay" column a number 6, under the "Bedding" column a 34, his own name under the "Feeder" column, 2½ under the "Hours" column, 28 (cents) un-

der the "Rate" column, then calculated the "cost of labor" as 70 cents (2½ x 28) the "Cost of Feed" (and bedding) as $11.25 and the "Total Cost" for the day as $11.95.

The second day only 4½ bales of hay and 32 pounds of salt were used. Two and a half hours spent in watching as well as feeding them. That day's total cost amounted to $3.27. Not until the sixth day in the feedlot was any cottonseed meal supplement added. On the 12th day ground corn-and-cob was introduced into the ration. The silos were opened for business on the 25th of November so that from then on the feeding ration was complete. Since corn was fed twice a day, the herdsman found it easier to keep his book in the feed room, jotting down the amount used both in the morning and evening after totalling the sacks weighed.

At the end of November, when the 30th line was completed, a few extra minutes were needed to total up the columns for the monthly costs. In this instance it was found that 7,218 pounds of corn had been used, 1,620 pounds of ensilage, 140 bales of hay, 1,300 pounds of supplement, 100 pounds of salt, 64 pounds of mineral and 49 bales of straw for bedding. The total labor cost for the month amounted to $18.98, total feed $151.88 and the grand total $170.86.

If you have your own stock scales so that you can weigh the stock at dawn on the first of each month your set-up is perfect. In that event you can get your cost per pound for each month. However, in case you have no access to stock scales, the closest accurate calculation will be the daily cost per head. From that figure a close estimate can be made of the cost per pound by judging how the stock seem to have been feeding the past month.

By December 1, the 37 head had gained 3,800 pounds, an average of 3.8 pounds per day during the first 27 days in the feedlot. The high average was natural, due to gaining back the shipping shrink. In order to break down the costs into "cost per animal per day" and "cost per pound gained," the following method was used: Multiply the 37 head of steers by the number of days on feed for that month (27). The answer here will be 999. Now divide the total cost of the feeding and handling ($170.86) by 999 and you will get the cost per animal per day. In this case 17 cents plus. Since we know the gain amounted to 3.8 pounds per day, divide that into the 17 cents and 4½ cents will be found to be the cost per pound. All this computed data should be put down in the "Remarks" along with the shrink from Kansas City, the initial

weights, etc. The "Remarks" makes the record a diary as well as a cost accounting sheet.

For the next month, take a new sheet, filling in the heading and the bottom of the reverse side the same as before, being careful to note any changes in prices of feeds purchased, weights, etc. In this instance, after the 31 days of December were completed, it was found that the total cost had jumped to $192.10 while the pounds gained had dropped back to a subnormal 1.73- pound average. While the cost per head per day dropped to 16¾ cents, the cost per pound jumped to 9 cents plus. As can easily be seen, the cost per day dropped ¾ cents from 17½ cents to 16¾ cents per head even though the grand total for that month increased $21.24 simply because there were three more days of feeding included in the month of December than in November.

The month of January varied only slightly from December. Due to an evident increase in average gain per day, the cost per pound dropped from 9 cents plus to 7 7-10 cents per pound cost. Since the cattle lacked only one day of being 90-day feeders, it was interesting to compute the actual cost per pound up-to-date. In other words, what could they be sold for on that date and break even.

Looking back in the "Remarks" of the November sheet, the initial cost was found to be $2,362.41. Adding to that the total costs for November, December and January, the total cost up to February 1, amounted to $2,916.21. The February 1 weight totalled 34,295 pounds. That figure divided into the total cost gave a figure of 8½ cents per pound. The drop of ⅔ cents per pound under the initial cost was due to the fact that the feeding gains during those 89 days cost only 6¾ cents.

The 28 days of February cost $177.39. The cost per head per day jumped to 17⅕ cents as against 16⅔ cents per day in January. The daily gain in February, dropping to 1.84 pounds, raised the cost per pound for that month to 9½ cents.

By March 20, it was felt that the average weight per steer would be around 1,000 pounds. The time had arrived to think of selling. From the figures it was easily ascertained that $8.76 per cwt., less 3 percent shrink, would have to be asked to break even if sold over our own scales. Knowing that 1 percent would be shaken off the carcasses before the cattle would be weighed if they were to be sold over a local packer's scales, $8.85 would have to be asked for them in order to break even. Actually the 37 head were sold to a local packer for

the current market price of $10 less 3 percent.

When the 37 head were weighed at dawn the morning of March 25, it was found that at their weight of 36,210 pounds they averaged only 978 pounds each instead of the 1,000 pounds we had hopefully estimated. The packer's scales agreed within 1 percent of ours that morning, as was expected, so it was decided that the miscalculation on weights was entirely due to changing the hour of weighing each month. The monthly weighing had been done at the most convenient time of that particular day with no thought given to water fill, etc. That was one of the little things learned indirectly through cost accounting.

The adjusted weights showed that the feeding program over the 141 days cost $8.95 per cwt. rather than the $8.50 originally estimated. The daily average rate of gain having been 1.98 pounds, the net selling price after shrink netted $9.60½, or a profit spread of 65½ cents per cwt. The total group profit amounted to $236.89. Roughly figured, $236.89 amounts to approximately 20 percent on the money invested over the 141 days.

Besides knowing what actual profit was made on the four months' work, other statistics of value could be calculated from such a cost accounting record. For instance, in totalling up the corn columns for all the months, it is seen that it took 1,182 bushels of corn to gain 10,235 pounds of beef. One bushel of corn equalled a gain of 8⅔ pounds of beef. Since the corn was of a good quality, it is now necessary to check up and find out why the ratio was below normal (one bushel equalling 10 pounds gain). Another piece of interesting data garnered from the cost accounting records is the fact that 65 cents per bushel was received for the corn instead of the 45 cents charged. The 65 cent figure is arrived at by dividing 1,182 bushels of corn into the $236.89 profit and adding the resulting 20 cents per bushel to the 45 cents already charged.

The average daily ration per steer was:

15.6 pounds corn and cob	$ .091
4.3 pounds ensilage	.001
5.5 pounds mixed hay	.02
1.3 pounds cottonseed meal	.02
Average cost per day	$ .14
Average cost per pound gained	$ .07

In these last few years the feedlot phase of the beef industry has become a highly specialized profession. Witness the increasing numbers of cattle shipped into the Cornbelt each year, and the growing interest in the annual cattle tours conducted by the agricultural extension services. All these things tend to show a

step in the right direction namely, that the feeder wants to learn how to better his own technique. If he only realized it he could earn for himself more actual value in returns and learn more about his own particular business than through all the cattle tours, "Farmer's Weeks," extension bulletins and other educational advantages put together simply by taking the time and effort to keep a cost accounting system on his own operations. He could quickly find out how efficient his own methods are and make any necessary changes which he cannot do by reading and adopting the controlled methods used at the experimental farms.

This article doesn't intend to deprecate the work and results of our experimental stations in the least. It only wishes to impress upon the reader the fact that a thorough understanding of one's own conditions is vitally necessary in order to better appreciate whether to accept or discard the various results as set forth in the current bulletins or lectures. This educational matter would be of much more value under such conditions than would be the case if it were followed blindly just because it sounded logical.

Humus for Plant Nutrition

Condensed from The Rural New-Yorker

AVERAGING the composition of 28 plant materials typical of the vegetative parts of plants which return to the soil to renew the humus, shows nearly twice as much potash, more than twice as much lime, and three to six times as much phosphorus as the average of 22 typical mineral soils. Plant residues decompose quickly, soil minerals slowly. These residues and the soil humus are an immediate source of nutrients for plant growth.

During many years of humus accumulations there has been considerable concentration of available nutrients obtained from soil minerals and the air in organic combinations.

Nearly all the nitrogen of the soil is organic. Starting with plant materials, averaging perhaps 2 percent or less of nitrogen, such changes occur in the process of humification that the incompletely decomposed residue, called humus, contains around 5 or 6 percent of nitrogen. One-third

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to one-half the total phosphorus of the surface soil is in organic form.

Four percent of organic matter in nine Illinois soils contained nearly as much phosphorus as the other 96 percent of mineral matter. A similar relationship holds with regard to sulphur. This humus phosphorus and sulphur came orginally from soil minerals and has been gradually changed to organic combinations.

Fresh humus material added to the soil has a favorable effect upon phosphorus availability and utilization by plants. Pierre cites data from Virginia which indicates that peat moss added to the soil may increase the effectiveness of phosphate fertilization. Where the organic matter was raised to 3 percent by adding peat moss to the soil, lima beans made good yields with one-third as much superphosphate as where the organic matter was 1 percent. Green manures are cited as a satisfactory source of organic matter.

Old soils, long cultivated, lose their active humus and vital processes are retarded. At Missouri, after 13 years of repletion by clean cultivation and cropping with little humus renewal, the maximum nitrate accumulation was reduced 35 percent and delayed three months compared with the virgin soil. The capacity of the depleted soil to deliver nitrates to a growing crop had been reduced more than a third in 13 years. Along with this change, the soil also lost its capacity to supply available potash, phosphate, lime and other things important to plant growth. Yields dropped accordingly.

Commercial fertilizers are sometimes incorrectly called complete fertilizers. A complete fertilizer in the strictest sense must carry some of everything needed by the growing crop. Few, if any, commercial fertilizers come in this class. Stable manure that has been well preserved is a complete fertilizer, though it may not have good balance. The ratio of one element to another can be improved when fertilizers are used with the manure. Superphosphate and manure make a good combination.

Feustel, of the U. S. Bureau of Chemistry and Soils, suggests that it is probably that some of the favorable effects from the application of manure, leaf-mold, or similar organic materials, is due in part to the presence of the rarer or secondary mineral elements, such as manganese, boron, zinc, barium, copper, iron and others that may be deficient (or of low availability) in the soil or become depleted by continued cropping.

Willis, of North Carolina, refers to data which show that manure corrected a manganese deficiency in Florida soils, a boron

deficiency in Finland soils, and a copper deficiency in North Carolina soils. Greenhouse trials at the Oregon Station show that manure compost corrects boron deficiency quite effectively for growing sunflowers, beans, tomatoes and other plants. This means of correction of boron deficiency is especially affective in soils low in organic matter where the available boron is low and marked deficiency symptoms appear. Such deficiencies no doubt arise in part as the result of humus depletion.

The purpose of fertilizing is to supply nutrients of such a nature and quantity as are necessary to supplement those provided through the natural soil processes. In the breaking down of organic matter in the soil a certain amount of nitrogen is liberated. With adequate nitrogen from this source there is no need for nitrogen fertilization. Only when natural processes do not supply the needed nitrogen is the use of commercial fertilizer necessary. The same relationships apply with reference to any fertilizer whether used to supply phosphorus, potassium, boron or other elements.

When fertilizer is applied to the soil, even in the presence of vigorously growing plants, not all is used by the crop. Some is fixed in the soil and perhaps some is lost.

Stewart points out that out of 19,600 pounds of superphosphate that has been applied to one of the plots at the Rothamstead Experiment Station in England, over a period of 50 years, 85 percent remained in the soil fixed in some form that prevented its leaching. Fixation of nutrients in organic combinations through the agency of soil micro-organisms or otherwise is usually desirable. When superphosphate is added to the soil, some of the phosphorus may be fixed in organic form and some in mineral combinations.

Pierre states that next to the soluble calcium phosphate, in which form the phosphorus or superphosphate is found or magnesium phosphate, which is the form in which phosphorus is translocated in the plant for storage in the grain or seed, organic phosphorus is probably the most available found in soils. The organic phosphorus of old soils with depleted humus is less available than in soils where active humus has been maintained by regular additions of fresh organic materials. Combinations of phosphorus with iron and aluminum are slowly available and undesirable. A good preventive against this latter form of phosphorus fixation is liming and supplying an abundance of active humus.

Rotting organic matter stimulates root development and there-

fore results in a more efficient absorbing system for plants. This means better use of both the natural soil fertility and fertilizers added to the soil. The stimulation to root growth may be due to improved soil structure, aeration, better moisture conditions, and more nutrients. Possibly also root hormones are generated in the decomposition of organic matter, since these substances are organic compounds. Part of the good effect of farm-yard manure may be due to root hormones. Salter, of Ohio, points out that indolylacetic acid, which has a powerful effect in stimulating root growth has been isolated from urine and no doubt occurs in manure. Also the chemically related skatole and hydrogen sulphide which are largely responsible for the foul odor of manure, have been credited with growth stimulating properties when present in small amounts.

Other such growth promoting substances as pnatothenic acid discovered by Williams, probably are provided by micro-organisms acting upon the organic materials of the soil. No one can say to what extent the good effect of active humus in stimulating plant growth may be due to some elusive vitamin-like substance, or growth promoter, which as yet escaped discovery and identification by scientific workers.

Wherever there is rotting humus, plant roots are found gathering the plant nutrients that are made available. In the forest, trees send a dense mat of feeder roots into the surface soil and even into the lower layer of rotting leaves.

When humus is brought into contact with raw soil, the inert mass takes on life, mineral nutrients are liberated and crops thrive. Just in proportion as humus can be supplied and to the depth to which its effects can be extended plant food is unlocked. Commercial fertilizers have a place in supplementing and balancing poor soils, but they cannot unlock the reserve of mineral nutrients in raw soil. For this use humus has a proven place.

Optimum Orchard Age

Condensed from New England Homestead

Lawrence Southwick

MORE and more we are hearing arguments pro and con on the question of optimum orchard age. Fruit specialists are seriously considering the point of view of Dr. J. R. Magness, United States Department of Agriculture pomologist. At several horticultural meetings in New England and elsewhere, Dr. Magness has stressed the fact that every apple region has made its reputation with young trees.

Noted sections in the East, Middle West and Far West achieved fame in the order named and this was, in effect, the order of sectional planting in this country. New England's early prominence was followed closely by that of New York, Pennsylvania, etc. The Middle Western areas and the intensive plantings in the Cumberland Shenandoah region lost considerable caste when lastly the great apple valleys of the Pacific Northwest were planted. The exceptionally well-graded fancy fruit from the young and intensive plantings in Washington, Oregon and Idaho soon became real competitors in eastern markets. The large attractive wrapped apples, layer-packed in standard western boxes, contrasted sharply with the eastern crop and helped to initiate better production, handling and marketing methods in the older section. Every year the trees in the orchards in the Pacific Northwest are growing older and soon even that section will have passed its prime. It is interesting to note that while in 1910 there were 151,000,000 bearing apple trees in the United States, in 1935, there were 83,000,000, and the estimated number in 1945 is only 66,000,000.

Each famous apple area has experienced definite periods of development somewhat analogous to the oft-quoted seven ages of man. In a general way the three significant stages, somewhat overlapping, have been the following: first, a rather rapid rise to prominence; second, a period of variable duration of generally accepted preeminence; and third, a slow downward trend leading eventually to decadence. The first two stages are characterized by a preponderance of young trees and productive orchards, while the third stage is colored by aging trees and orchard senility. The

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latter stage is quite prevalent today.

In New England and the older sections in general many excellent examples of the three orchard development stages exist. We even find single orchards encompassing all three as a result of continued planting, either for replacement or extension. Today 50 per cent of the trees in this country average over 25 years of age. Extension specialists, when scoring orchards in Massachusetts, deduct points from the total score of any orchard in which the trees are more than a quarter century old. Many orchardists admit that orchards more than thirty years of age often show a decided tendency toward decline in total production and especially in the production of large-sized, well-colored, high quality apples. The truth of this supposition depends largely on individual orchard conditions primarily as regards soil type and secondarily as regards soil management practices. On a favorable soil type and with reasonably good management an orchard will grow old much less rapidly than when it is beset with: first, a fundamentally poor soil—an excess or a lack of certain soil constituents such as gravel, sand, clay, and humus, shallowness, high water table, oxygen depletion, etc.—and second, poor management. It is problematical just how beneficial will be the effect of controlled irrigation of poor soil types on tree behavior. In the West, where irrigation is successfully used, the soils are mostly good agricultural types. Of course, neglect in a commercial apple orchard naturally fosters senility. Variety also is a deciding factor in determining tree longevity. There are countless trees throughout New England that show the ravages of age and poor care, and which would better be cut down as far as commercial cropping is concerned. Such examples of decadence are found not only in home orchards but also in extensive commercial plantings.

There are, on the other hand, orchards old in years but young in performance capabilities. For example, the McIntosh trees in the old Clark Orchard at the Massachusetts State College set in 1898 are still producing exceptionally good crops. During the last ten years this row of trees has averaged approximately 700 bushels per acre with individual trees yielding average annual crops of 35 to 40 bushels. A few trees in this relatively high-yielding block are performing rather poorly and have for several years.

Low producing trees in any orchard, young or old, tend to lower acre yields. Net income is decreased because operating costs are more or less fixed. As an or-

chard grows older, individual tree differences are apt to be more clearly defined. Furthermore, it is usually much more drastic to pull out a poor tree when it is some 30-40 years of age than when it is only 8-10 years old. Replacement is more difficult. Thus, old orchards are often problem orchards with low acre yields. Some of these undoubtedly should be replaced by young plantings. While an orchard still produces good crops on an acre basis, the age at which it should be removed is questionable and depends on many factors, chief of which are its future production potentialities. There is a Gravenstein tree in Nova Scotia 139 years old which is reported to have produced its best crop at the age of 97. In a well-known New York orchard, there is a Northern Spy tree some 140 years of age and still healthy. Many orchards over 50 years of age are still productive. But in such cases the per bushel production costs are liable to be comparatively high because the very size that fosters high individual tree yields likewise makes for difficult pruning, spraying and harvesting and the crops tend to "grade out" poorly.

Whether certain maximum ages for orchards will ever be recommended is doubtful. Right now the swing is toward young plantings with definite replacement program. By the use of certain clonal rootstocks now under investigation by the Pomology Department at Massachusetts State College, as well as by other stations, it may be possible and practicable not only to control tree size but to bring varieties into earlier maximum fruiting. This would tend to make an orchard a more intensive, shorter-lived proposition, and hence would allow the orchardist increased opportunity to keep abreast of significant variety changes which will probably be more prevalent in the near future than they have been in the immediate past. The prime concern of the grower is to produce popular apples at low costs. High unit—whether tree or block or orchard—yields are essential. The best means of bringing this about may be a change in soil management in one case, partial or total tree replacement in another, a shift in orchard location in still another and so on. There is no one cure-all.

During this coming season growers might well "take stock" and determine which trees and which blocks are functioning below par. Some orchardists keep tree production records and for them the task of segregating the best, the fair and the poor producers is relatively simple. After the facts are known, then a decision must be reached as to what is to be done. It should be kept in mind that other factors

being equivalent a poor 5-year-old tree will never "catch up" with a vigorous tree of the same age. It will not only lag behind in growth and production, but it will grow older sooner. Poor location, disease effects, direct injury, and sometimes genetic make-up of the seedling stock together with a possible incompatibility of stock and scion may be casual factors. The effects of poor location and disease may be ameliorated somewhat by proper management. Injuries caused by mice, winter cold, wind, or cultivation tools must be properly evaluated before the choice can be made between remedial measures or removal. Hurricane injured trees need particularly careful appraisal. And lastly, those poor trees which never could seem to get on their feet should be replaced—and the sooner the better.

The importance of the orchard age question has been emphasized by comparatively low price levels for apples in recent years. When prices are high, less agitation for replacement of old trees by young is usually the case. Nevertheless, tree age is a factor to be considered in the growing of large crops of high grade fruit. It is an individual problem, however, making the set-up of definite age standards practically impossible.

Research Replenishes Florida's Sugar Bowl

Condensed from Better Crops With Plant Food

J. Francis Cooper

Florida Agricultural Experiment Station, Gainesville, Florida

RESEARCH, the handmaiden of progress in both agriculture and industry, has enabled a struggling sugar industry in the Florida Everglades to emerge from bankruptcy to a paying basis, held in check now only by quota restrictions. Better varieties of sugarcane, heavy yielders maturing at proper times and resisting pest attacks, have been developed by plant breeders and have literally "saved the day" for the Everglades sugar industry.

Ruins of Spanish and Mission sugar houses still to be seen in northeastern Florida are evidence of the fact that early Spanish settlers attempted sugar production in Florida. Although cane has been grown for sirup continuously in the State, the reasons for sugar failures are clothed in obscurity.

Of more recent origin, the Everglades development can be traced from records, however, and its story is a saga of overcoming production handicaps through experimentation—a success story written in thousands of acres of fertile muck soils now growing sugarcane and giving support to about 5,000 families of laborers and other employees.

When the Federal government ceded the Everglades to Florida under terms of the Swamp and Overflow Lands Act of 1850, the State became obligated to improve and develop the area. About 1905 it set about a program of draining this 3,000,000 acres of flat saw-grass plains surrounding Lake Okeechobee, where for hundreds of years dense sawgrass had grown, partially decayed, fallen back into the water, and thus prevented from continued oxidation had built up a deposit of peat ranging from one to several feet deep over the entire area. Drainage canals were dug to lower the water level, and early in the 1920's farmers began to take over portions of the Everglades.

Since sugarcane is a tropical plant, dreams of an immense sugar bowl again haunted those interested in developing Florida. Very early attempts to grow sugarcane were made at Moore Haven and Hialeah. In 1923 F. E. Bryant transported on flat-

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bottom barges, through one of the recently-completed drainage canals which connected Lake Okeechobee with the Atlantic ocean, equipment for grinding about 750 tons of cane a day. The outfit was set up at Canal Point, where the United States Department of Agriculture established a sugarcane research laboratory. The sugar house formerly at Hialeah was moved to Clewiston in 1928 and began operations, with the Canal Point plant later being co-ordinated with it.

In the spring of 1930 the company went into bankruptcy, and it seemed that this effort at sugar production in Florida was to meet the fate of earlier endeavors along the same line. A new company took over the operations in December 1931, however, and is now producing the universal sweet at costs lower than any other continental area, Hawaii, or Puerto Rico, about equal to the costs in the Philippines, and only slightly higher than those in Cuba. While efficient management naturally has played its part, research is largely the thing which has made this possible.

A branch of the Florida Experiment Station was established in the Everglades at Belle Glade in 1923. In September, 1930, it employed Dr. B. A. Bourne, a scientist formerly with the bankrupt sugar company and prior to that with the United States Department of Agriculture. The company permitted use of test plots on its lands, and a successful cane-breeding program went forward.

The Everglades has a long growing season and experiences only occasional frosts. Sugarcane will bloom there, and thus it is possible to make crosses in an effort to develop better strains and varieties. In the winter of 1930, Dr. Bourne made 2,717 crosses and self-seedings, from which he selected 92 canes to be carried forward in line tests. In 1931 more than 100,000 new seedlings were produced, of which 14,606 were planted in the field. From these 1,170 were selected for line tests, and gradually the number found desirable was reduced to less than 100, then to around 12. The patience of research was about to be rewarded. A few of these new strains showed definite and marked superiority.

Sugarcane is planted in the Everglades from August through the fall. Formerly the harvest season began in December and continued for 4 months, or into April. With the sugar house operating only 4 months, the company could not obtain best use of its labor, and so one of the things it greatly desired was to extend the harvest season. Success of the efforts by plant breeders is evidenced by the fact that the sugar house began its 1938-39 opera-

tions on November 1 and expects to continue for about 8 months.

One of the new canes developed by Bourne, simply designated F31-962, can be harvested as early as October 15. Mid-season varieties which will out-yield the old ones are available. And canes which will stand in the field until April and still retain a good sugar content also are available now.

Higher yields naturally have been sought, not only in tons of cane per acre but also in pounds of sugar per ton. Here again success has crowned the efforts. In 1929-30 a ton of cane produced only an average of 142 pounds of sugar. F31-962 will produce around 44 tons to the acre and will yield slightly more than 200 pounds of 90-test sugar per ton. Other strains return 180 pounds of sugar, or more, per ton. It requires 107 pounds of 90-test raw sugar to refine into 100 pounds of the table product. Refining of the Clewiston sugar is done in Savannah, Georgia.

The researchers have sought also to build canes which will stand straight and erect and are easily stripped for harvest.

The plant breeders are also seeking cold resistance in the new canes, since areas removed from Lake Okeechobee sometimes get killing frosts which necessitate rapid harvest of damaged cane. More susceptible varieties are planted near the lake, resistant ones away from it.

Fertilizer problems confronting the growers of sugarcane, as well as vegetable crops, in the Everglades have been of such nature as to test the ingenuity and imagination of the researchers. The raw sawgrass peat soils, which constitute the great majority of the Everglades area, although apparently containing vast fertility, refused to yield a harvest. Consternation reigned, since the State had spent two decades and millions of dollars in reclaiming the area, only to find the lands unproductive.

Investigators at the newly established Everglades Experiment Station tackled the problem with a vim and soon found that small amounts of copper were needed to induce the raw sawgrass peats to bring forth their harvests. On burned over areas, particularly, and later on other areas, manganese was found to be needed also. Very early work with sugarcane showed responses to this latter element.

Better Crops With Plant Food

The peat soils contain large natural amounts of nitrogen, and smaller amounts of phosphorus and even lower quantities of potash. As the years have passed since reclamation of the Everglades, it has become evident that potash is the first of the "big three" elements to become defi-

cient. This might have been expected, since potash is required in larger amounts by most plants. Striking responses with potash on these organic soils have been obtained in some of the tests, giving both better growth and higher disease resistance with vegetables and other crops.

Phosphorus deficiency develops later, as the peat soils are cropped for several years. It is entirely possible and even probable that a nitrogen deficiency will develop in time also, but it is not known how long this will take to become evident.

Must Control Pests

And another point where experimentation and accurate records have aided has been in rodent control. Rats infested the muck lands and would gnaw the canes near the base until the stalks fell to the ground and were lost to sugar operations. Agronomist Stevens made some careful checks and found that rats, rabbits, coons, and other rodents were causing losses ranging from 15 to 36 per cent of the crop. The Clewiston corporation appropriated $20,000 for rodent control, and now the pests are annually kept from damaging the crop, the company figures it saves $100,000 each year.

The only other pest giving noticeable trouble seems to be the wireworm, and this is a difficult one to combat. Fortunately, its ravages are not extensively serious.

The corporation with headquarters in Clewiston has 23,000 acres in cane, and harvests around 18,000 acres annually. Another sugar company began operations in Fellsmere in 1930 and has a smaller acreage. During recent months a co-operative group has been organized, with backing from the Clewiston concern, and the organizer states that he has 100 farmers signed and ready to plant 25,000 acres of cane if and when quota restrictions are lifted to permit.

The muck lands are first drained and then plowed and "moled" or under-drained with a bullet-shaped implement pulled through the ground working somewhat as would a mole. The cane is then planted and cultivated until it practically covers the space between rows. Stubble in the Everglades will produce for several years, but for one reason or another most of it is plowed up after 6 years. Now that the better canes have been planted, stubble may be left longer, unless still better ones are found.

The cane is harvested by hand, hauled on tractor trains to the nearest loading station on the company's railway. Each tractor pulls six cars each with a load of 4 tons which is mechanically hoisted onto railroad cars. The

tractor train just fills the railway car which holds 24 tons.

The corporation owns 75,000 acres of muck lands suitable for sugarcane production. It puts about 5,000 tons of cane through the sugar house in a 24-hour day, just about double the input 10 years ago. Its seasonal output for 1937-38 was about 323,000 325-pound bags of raw sugar, or 52,487.5 tons.

Those conversant with sugar production in the Everglades believe that Florida alone could produce a hefty portion of the nation's sugar requirements—could almost fill every sugar bowl in the United States. Conservative estimators say that there are at least 150,000 acres of muck lands in the Glades ideally suited for sugar production, which would yield around 600,000 tons of sugar annually, while the more optimistic believe that possible acreages and yields are several times those amounts.

A Two-Ton Litter

TWO tons of pork in six months from one litter is the record of H. W. Lecrone & Son, of Huntingdon County, Pa. This is a new high for the State. Their 18 pigs, sired by a pure-bred Spotted Poland China boar and farrowed by a grade Chester White Sow, weighed 4,159 pounds in 180 days. She is from a litter of 16. The first litter she farrowed had 16 pigs of which she raised 14. She raised 10 of her second litter of 13. The two-ton litter came next. On the day it was weighed for the State record, she farrowed 25 pigs, 18 of them living.

The two-ton litter was divided into two groups, one being allowed to nurse for half an hour and in about an hour the other group was permitted to nurse. The day started at five o'clock in the morning and continued until 11 P.M. When they were three weeks old, the intervals were lengthened. At 12 weeks they drank milk from a trough.

They were started on a grain mixture of ground wheat, barley and oats supplemented by a commercial product containing 40 percent protein. When two months old they were placed on Dwarf Essex rape pasture and self-fed.

During the last eight weeks, in addition to the grain mixture and supplement in the self-feeder, ear corn was hand-fed so that they had all they could eat. For the last five weeks they also received the grain mixture in the slop twice daily. At four months the litter weighed 1,984 pounds; at five months, 3,048.—*P. H., Rural New-Yorker*

World's Largest Purebred Sheep Ranch

Condensed from Sheep Breeder

P. V. Ewing

WYOMING is a big state and its sheep ranches are laid out accordingly. The King Bros. Company ranch, starts just northwest of Laramie, measures roughly 15 x 16 miles. In addition to this large tract, there are other farms and ranches leased and owned, which makes this ranch a large county in itself. On this ranch I found 3,500 head of Rambouillet ewes and 8,500 head of Corriedales, making it easily the largest Corriedale flock in the United States.

J. H. King, known to the sheep men of the country as "Joe," has managed this huge enterprise for the last fifty years. He has been operating it under scientific methods and is continually breeding for wool improvement and better mutton sheep. The president of the King Bros. Company is Herbert J. King, who is not only a prominent banker in Laramie, but is president of the Wyoming Farm Bureau Federation and is kept pretty busy with other numerous civic enterprises. Fred Barrett is the active manager of this ranch and lives at the ranch headquarters. Fred and Joe make an unbeatable team. A recent addition to the force is Joe King's son Richard, who graduated in commerce at the University of Wyoming and who actively manages the financial end of this huge enterprise.

The main ranch consists of some 125,000 acres, which is about equally divided between summer and winter range, the winter range being on the Laramie plains, which extend for many miles west of Laramie. At headquarters you will find the lambing pens and sheds capable of taking care of as many as 2,000 ewes with their lambs at one time. While the entire flock of sheep on this ranch are purebred, not all of them are registered. The registered ewes all lamb in individual lambing pens in order that there can be no mix-up between the lambs and their mothers and, after lambing, they are thrown together eight or nine in a lot and, after three days, are put into pens 100 to 125 head. The lambs are branded and docked at once. The main lambing shed is over 200 feet long, has an alleyway 32 feet wide in the center, with individual lambing pens

Reprinted by permission from the Sheep Breeder, Chicago, Ill., July, 1939

on each side. Its width is 70 feet. These individual lambing pens are all 4 feet square.

For weak lambs and unclaimed lambs a heated incubator room is provided and, with the heated hospital room, as they call it, which is 60 feet long and has 38 pens in it, they can easily care for lambs in January regardless of how cold it is. A Delco lighting system supplies light for the night force.

Just outside the large lambing house and other sheds is to be found a huge dipping outfit. They dip all sheep once a year beginning June 10th—just before they go on the summer range, when all sheep are sheared and ready for growing a new crop of wool. Cooper's fluid dip is used in this outfit and, instead of dipping, it is sprayed on. This Australian spray system is operated by force with a rotary pump run by a Fordson tractor. With this outfit they can handle 6,000 head of sheep a day. The dip is heated with some coils before it is used and the old dipping tank is merely used as a supply tank.

With 15,000 to 20,000 head of ewes and lambs, it is necessary to handle the sheep in bands, which usually run about 2,500 to the band in winter and 1,500 head of ewes with their lambs when they are on the summer range up in the mountains, which range in elevation above 10,000 feet. The winter range is only 7,000 feet in elevation.

The lambs are docked or tailed at about ten days of age, with a hot iron and they have become so expert at it that practically no losses occur. The ewes with their lambs are thrown into small groups first and later into larger groups until about 500 head are in a group, and then three of these lots are thrown together to make a band to go into the summer range. I found most of the bands were being cared for by two herders.

In order that there can be no mixup of the lambs and ewes of the purebred flock they are numbered or branded and checked every ten days. During the breeding season, the purebred ewes have to be divided into small lots of 75 head each, with one buck to each pen. The ewes are branded when bred and this brand stays on till lambing time. With this system they never get a "dry" into the lambing pens. While most of the lambs that come are single, they have enough twins and save such a high percentage of their lamb crop that they have averaged as high as 120 per cent lamb crop under range conditions, which is exceedingly high. They do not care for twins and prefer singles, as they usually do better.

The feed or range is composed largely of Buffalo, gramma grass and all different kinds of sage-

brush, of which the white and salt sage are considered the best. They keep salt available for the sheep at all times except when they are ranging on salt sage pasture. I was very much interested in the huge piles of manure that accumulate around the camps and could not help but visualize what great value it would have if it were available to some golf course or huge estate. They do not bother with the manure as they say when they put it on the land the wind blows it away. When the piles get too high they either haul it away from the sheds, or move the camp.

They use alfalfa extensively around lambing time and, with the rich feeds fed, the manure would naturally be of very high value if it was where it could be used.

When the purebred flock is lambing, they divide the ewes into small pens, and leave them on the range in the day time and have the lamb wagons go out and throw the ewes and lambs in separate compartments in the wagons and haul them to the shed, putting them in the small pens together. Lambing usually comes from the 15th of April to the 15th of June. A few of the registered ewes are lambed in March. At the height of the lambing season they will have from 250 to 300 head of ewes lambing every twenty-four hours.

On the winter range corrals are provided at intervals of every five miles. Altogether there are twenty winter camps. These are all snow-fenced and a two or three days' supply of food is kept available in case of a snow storm. Snow comes any time after the 9th of September and continues up until the first of June. The last bad storm usually comes around the 10th of May and the first bad storm in the fall around the 20th of October. It was interesting to note that, even though they might have two or three inches of snow on their winter range, the sheep were capable of securing their own feed, and supplementary feeding was not necessary. I saw bands of bred ewes in the pink of condition and as fat as butterballs, and they had not had any grain during the entire winter.

In the bands there are sheep that are called "markers" or "bell" sheep—about one to every hundred. This enables the herder to better keep track of his band. The herder counts his markers every day and counts his sheep individually once a week. At this high elevation it sometimes goes down as low as 30 degrees below zero. When these blizzards come, the herder must protect his sheep from frozen legs and wool blindness.

During the summer and late fall ample feed supplies are laid in

for the winter months. At this time the shearing pen is used for a grain elevator and in the winter is filled up with cottonseed meal, barley, oats and other concentrates.

Shearing time is a busy one with a flock of this size. Of course many shearers are employed, each shearer furnished his own handpiece. A helper is furnished for every four shearers, to catch the sheep and hand them to the shearers, and take away the shorn sheep. These shearers average from 150 to 200 head a day apiece. After they are shorn they are thrown into the tally pens to be counted. Eight shearers work in each gang.

While this shearing plant was originally designed according to the most approved Australian systems, only a portion of this system is now maintained. The sheep are sweated in special pens just prior to shearing to make them shear better. While in the Australian system the wool was graded and baled, it is now sacked in regular wool sacks holding from 350 to 500 pounds of wool, with only the skirtings and manure lots separated.

Frank S. King established the King Bros. Company back in 1875. Across the Laramie Mountains at Wheatland, they have many hundreds of acres of irrigated alfalfa land. Many of their lambs are wintered and fed at Wheatland. Wheatland is about 75 miles away and the lambs are ranged there at about the rate of ten or fifteen miles a day, starting the first of October.

It was interesting to note that all of the various twenty camps were designated by names, largely from some geographical characteristic or by the name of the man to whom the land at one time belonged. Most of the camps have telephones in them. They have to watch weather reports religiously and use the radio and barometer, and every herder and man who works on the ranch has to carry a compass. Even the automobiles and camp tenders are required to carry compasses as a matter of protection. Names for some of these camps, for example, are the 2-Bar, Timber Canyon, North Corral, Wyoming Camp, etc. Windmills are strategically scattered over various parts of the ranch to provide water. Long posts are laid from the main camps toward the various winter corrals, arranged like the spokes of a huge wheel. These posts are used sometimes for stringing telephone lines, but mainly for the purpose of guiding herders and their bands in case of a storm. A herder lost in a storm with a band of sheep moves until he strikes one of these lines of posts and in either direction he will find a camp.

BARN OWL
MONKEY-FACED OWL

Are They Vermin? (VI)

E. Lawrence Palmer
Prof. of Rural Education, Cornell University

BARN OWL

Tyto alba pratincola (Bonaparte)

Relations and life history—North American species, 1. Family Tytonidae. Nest in old building or hollow tree, little nesting material. Eggs, 5 to 11, white, 1.73 by 1.28 inches, hatch in 21 to 24 days into white downy, helpless young. Incubation begins with laying of first egg so it hatches first. Two broods a year. First winter plumage follows second down and stays for about a year. Young grotesque and hiss at visitors.

Behavior — Food, essentially rats, mice, and other small mammals. A bird killed at a game farm as a destroyer of feathered game had nothing but mammal remains in it. Of 39 stomachs examined, 17 contained mice; 17, other mammals; 4, birds; 4, insects; and 7 nothing. Estimated that a family of seven young barn owls would require 150 rats and mice daily to satisfy their appetites.

Reaction to heat, light, and moisture—Active at night and at dusk. Thought of by superstitious people as a bad omen, possibly because of strange screams and clucks which it gives from hidden places.

Relation to man's interests—Probably the most efficient feathered check on small mammals which are injurious to crops and to man's interests. Justly protected by law in New York. Not **vermin.**

Description—About the size of a crow. Length, 21 inches; wing spread, 47 inches; weight, 1½ pounds. Female, larger than male usually. A long-winged, long-legged, white-faced, light-colored crow-like bird, flies erratically and lightly.

Where found—Almost any kind of country where food of rats and mice may be found and where reasonably protected.

Range—From Washington or British Columbia through Colorado to Massachusetts and south to Nicaraugua, with allied races in South America, Asia, Europe, and West Indies.

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Poultry Pointers

Points Indicating Good Vitality and High Production

Comb—large, silky, full and red

Eyes—bright and prominent

Eye rings—white and clear

Beak—white

Shanks—white, thin and flat

Pelvic Bones—wide apart, soft and pliable

Skin—thin and loose, with no hard fat

Vent—white or bluish white; broad and moist

Plumage—clean, glossy and with a good sheen

Points Indicating Low Vitality and Poor Production

Comb—pale in color, small and shrivelled

Eyes—small, sunken and dull

Eye rings—yellow

Beak—yellow

Shanks—yellow, round and full

Pelvic bones—close together, hard and rigid

Skin—thick and underlaid with fat

Vent—yellow, shrunken and dry

Plumage — lacking in luster, shabby

For the Farmer's Library

These books are recommended as outstanding in their field:

Poultry Husbandry

By Morley A. Jull, Professor of Poultry Husbandry, University of Maryland. Published by McGraw, Hill & Co. $3.50.

(See Farmers Digest, July, 1939)

Pork Production

By William W. Smith, Professor of Animal Husbandry, Purdue University. Published by the Macmillan Co. $3.75.

(See Farmers Digest, September, 1939)

Feeds and Feeding

By F. B. Morrison, Professor of Animal Husbandry and Animal Nutrition, and head of the Animal Husbandry Department, Cornell University. Published by the Morrison Press. $5.00.

(See Farmers Digest, October, 1939)

Feeds and Feeding, Abridged

By T. B. Morrison, Professor of Animal Husbandry and Animal Nutrition, and head of the Animal Husbandry Department, Cornell University. Published by the Morrison Press. $2.75. This book is especially adapted for use by students of Agriculture.

(See Farmers Digest, December, 1939)

Beef Cattle

By Roscoe R. Snapp, Associate Professor of Animal Husbandry, University of Illinois. Third edition is to be published this fall. Published by John Wiley & Son, Inc. $4.00.

(See Farmers Digest, November, 1939)

For the convenience of our readers, books listed may be purchased through the Farmers Digest. Address C. Leavitt Dyer, Farmers Digest, Ambler, Pa.

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STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACTS OF CONGRESS OF AUG. 24, 1912, AND MARCH 3, 1933

of the Farmers Digest, published monthly at Ambler, Penna. for October 1, 1939

State of Pennsylvania | ss
County of Montgomery |

Before me, a Notary Public in and for the State and County aforesaid, personally appeared L. Rush-Brown, who, having been duly sworn according to law, deposes and says that he is the Editor of the Farmers Digest and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management, etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, as amended by the Act of March 3, 1933, embodied in section 537, Postal Laws and Regulations, to wit: 1. That the names and addresses of the publisher, editor and associate editors are: Publisher, The School of Horticulture, Ambler, Penna.; Editor, L. Rush-Brown, Ambler, Penna.; Associate Editors, C. L. Dyer, New Hope, Penna.; A. E. Reick, Ambler, Penna. 2. That the owner is L. Rush-Brown, Ambler, Penna. 3. That the known bondholders, mortgagees and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages or other securities are: none. Signed, L. Rush-Brown, Editor. Sworn to and subscribed before me this 29th day of September, 1939 (Seal). Z. A. Cassidy, Notary Public. (My commission expires September 18, 1942.)

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